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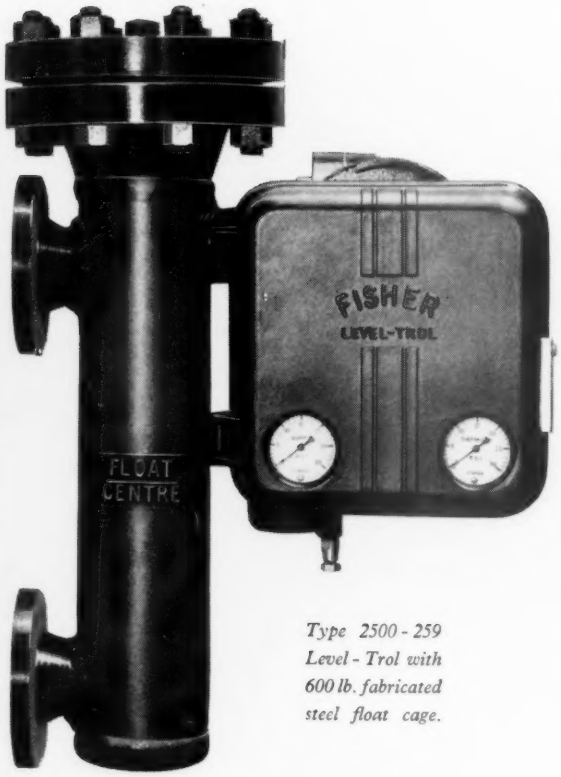


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**Vol. 8, No. 95** **November 1954**


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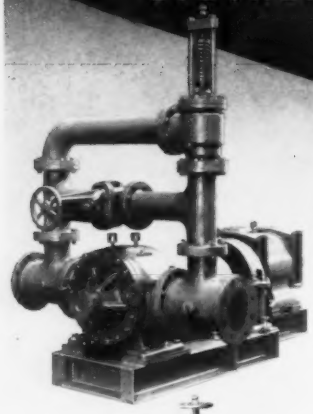
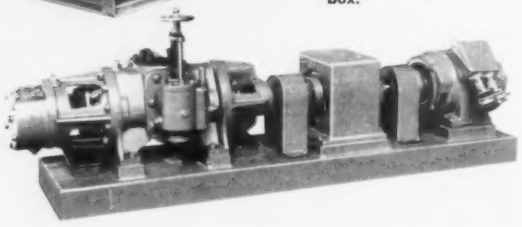


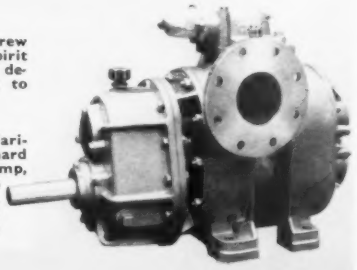
(Left)
Positive Acting Rotary Displacement Pump for the handling of Molasses and viscous fluids, electrically driven through totally enclosed Reduction Gear Box.

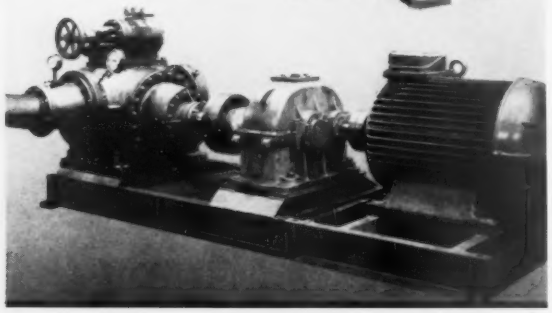
(Below)
Positive Acting Screw Displacement Spirit Pump, electrically driven through Wall Box.



(Right)
Positive Acting Screw Displacement Spirit Pump specially designed for fitting to Road vehicles.

(Below)
Positive Acting Variable Output Guinard Rotary Piston Pump, electrically driven through Reduction Gear Box, for Oils of varying viscosity.





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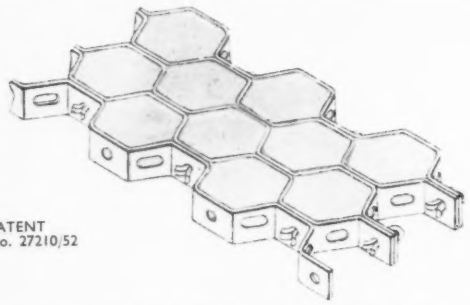

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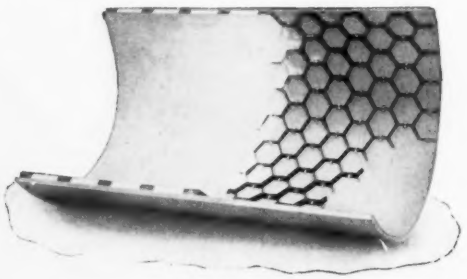

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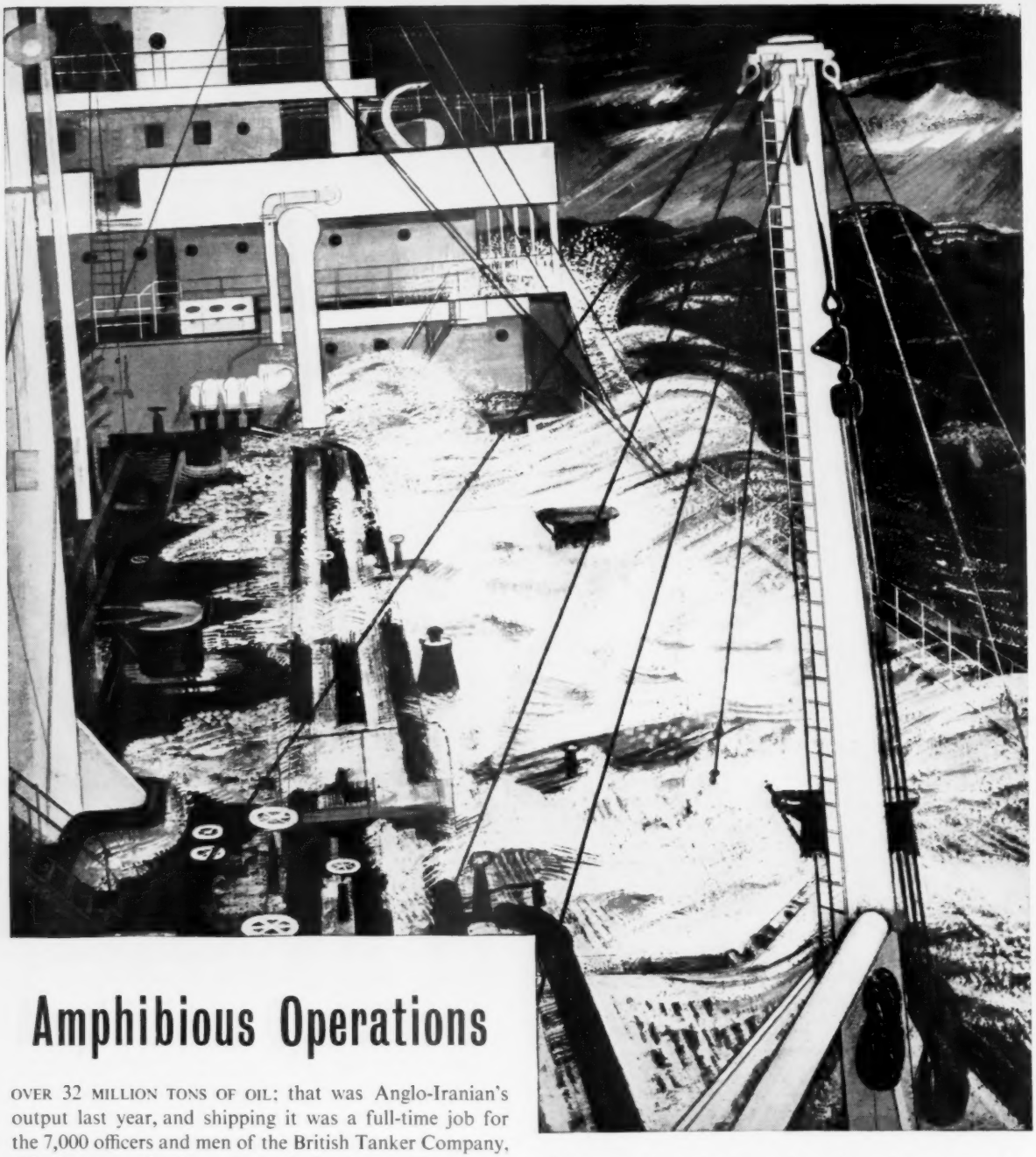

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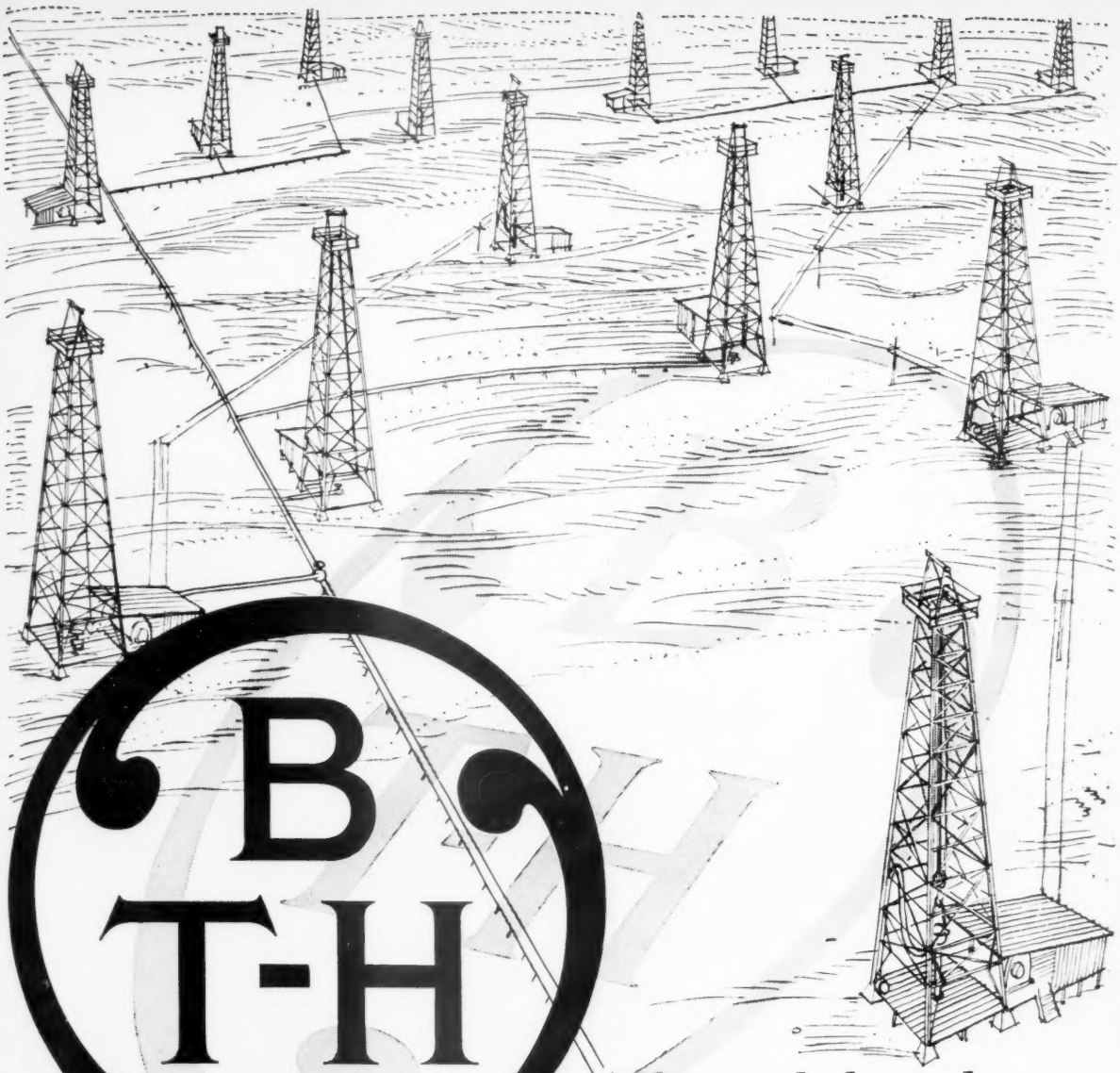

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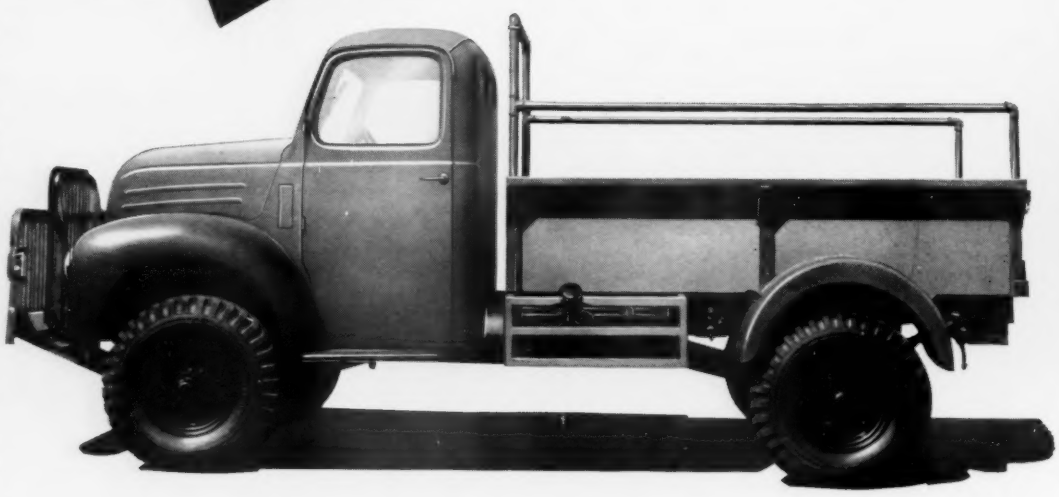

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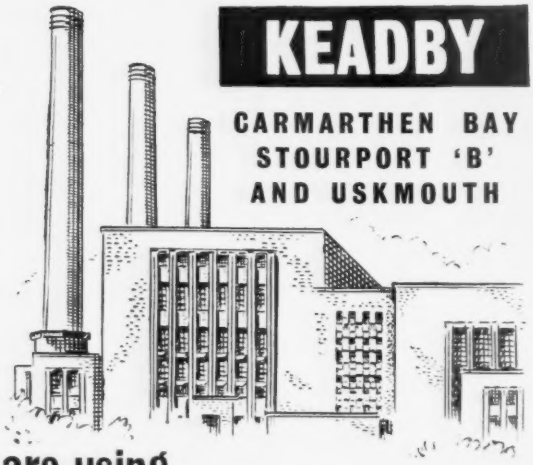

are using

## J. & P.
## ALUMINIUM SHEATHED
## POWER & WIRING CABLES

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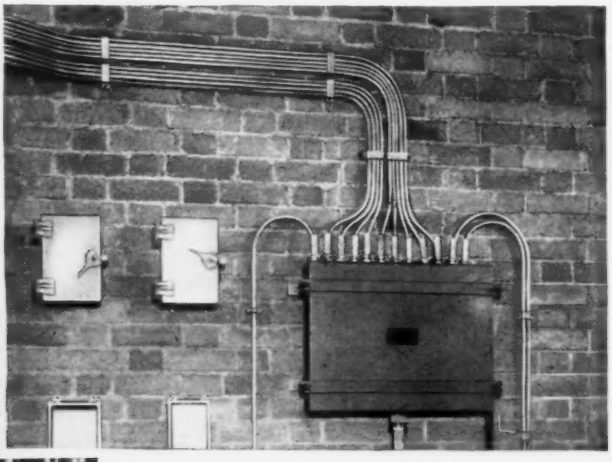

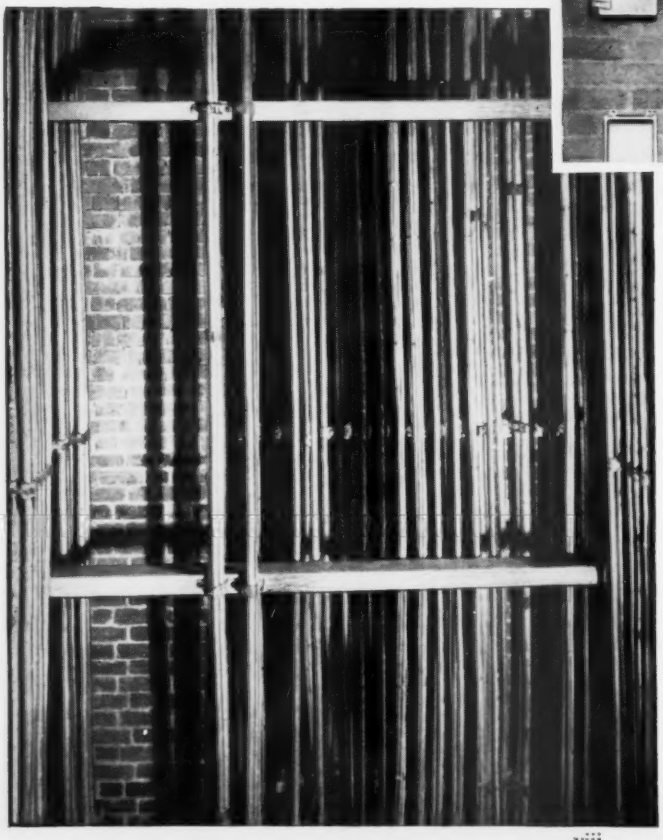

*Above:* Neatly installed formations of aluminium sheathed wiring cables terminating in a marshalling box.

*Left:* A main cable trunk at Keadby comprising 150 h.v. and l.v. cables, all but a few being aluminium sheathed.

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Keadby is the first of several new power stations in which extensive use has been made of aluminium sheathed cables.

Three of the 60 MW sets are served by J. & P. Aluminium Sheathed Cables, a total of 73 miles of paper insulated and rubber insulated types being involved.

Photographs taken at Keadby Power Station.
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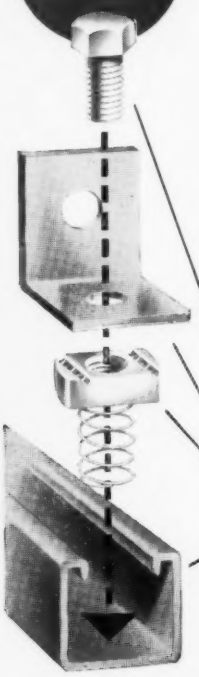

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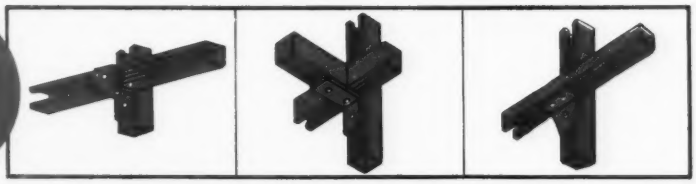

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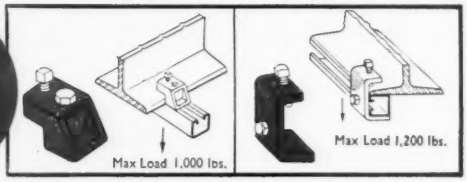


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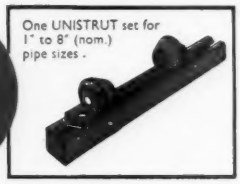


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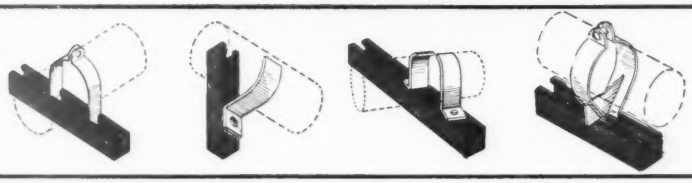

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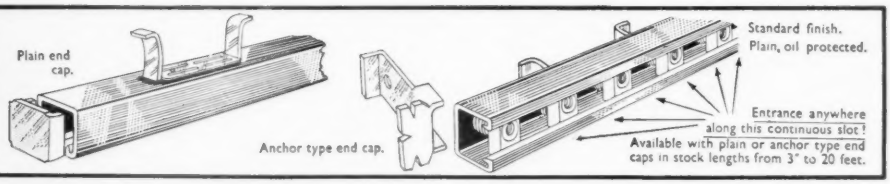
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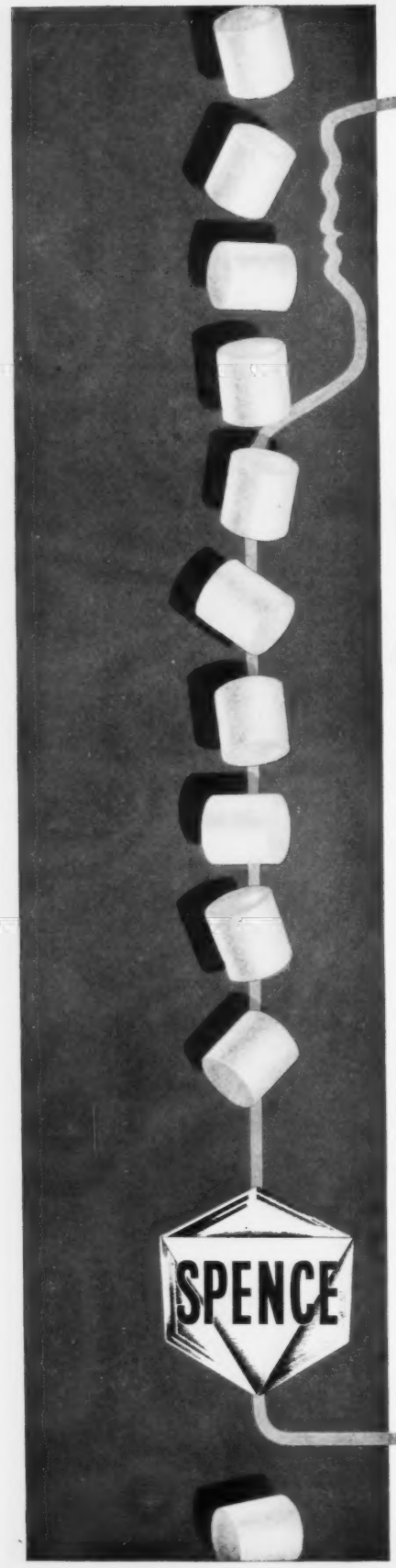


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# Road Transport in the Oil Industry*

*By* A. T. HILLS†

The purpose of this paper is primarily to deal with the use of road transport in the oil industry and this is set against a background of the changing overall distribution pattern consequent upon the greater development of refineries in the U.K. This development has been dealt with in a paper given by T. W. Mathias and published in the Journal of the Institute in March, 1953‡.

It will not be possible in this paper to cover all the uses of road transport, and for this reason it will exclude the movement of chemicals derived from refining processes and dwell mainly upon the road movement of fuels for power, heating, and other uses, and lubricants.

### Legal Aspects

The design and employment of road vehicles are governed by Transport Acts and Regulations, and in the specific application of highly inflammable products by the Petroleum Spirit Conveyance Regulations.

The Transport Acts cover two broad fields—design and operation. In the design of a vehicle the regulations impose maximum axle load weights, braking systems, tyre conditions, use of windscreen wipers, mirrors, warning instruments, etc. The most important of these regulations is that a two-axle vehicle must not exceed 12 tons all-up weight, a three-axle 19 tons, and a multi-axle 22 tons.

In the operation of vehicles there are regulations for maximum speeds, drivers' hours of work, carriers' licences, drivers' records to be kept, compulsory insurance against third party risks, and so on. The two important operational regulations are those concerning speeds, which allow a vehicle of three tons and less unladen weight to travel at a maximum of 30 m.p.h. Over three tons they are restricted to a maximum of 20 m.p.h. Since the early application of pneumatic tyres more than 25 years ago, the previously-mentioned maximum speed of 20 m.p.h. has been in operation despite the considerable progress in vehicle design and

*Fig* 1. *A.E.C.* 3200-*gallon double-compartment rigid fuel oil vehicle drawing a* 1700-*gallon single-compartment trailer.*

performance. These are just a few of the Transport Regulations from some hundreds which have to be complied with.

The Petroleum Spirit Conveyance Regulations relate specifically to road vehicles employed in the movement of products which flash below 73°F. These Regulations define the maximum carrying capacity, recently increased to 4000 gallons with no compartment exceeding 800 gallons. Special design features must be applied, such as a fire-resisting shield to separate the cargo tank from the engine, batteries, exhaust, etc. The cargo tank must have efficient footvalves, and draw-off taps must have locks. The design of a road tanker exceeding 1500 gallons capacity must under these Regulations be approved by the Home Office. Conditions relating to loading and discharging are also specified in the Regulations which have as their aim precautions against the risk of fire which can arise from static electricity causes.

Road tankers operate from a variety of storage plants, refineries, ocean-fed terminals, inland water-fed storages, and

*Fig* 2. *Leyland articulated* 2000-*gallon single-compartment electrical oil vehicle. The rear tank section houses pump and motor, and special equipment to prevent moisture forming in the product. The continuous wet hose is fitted with an instantaneous coupling.*

inland rail- and road-fed storages. All of these have highly specialized equipment and facilities for the storage, loading, and despatch of products. There are approximately 45 different products of bulk fuels, etc., excluding lubricants, each requiring separate storage and handling. Each marketing company may have as many as 500 different blends of lubricating oils for automotive and industrial uses. In some industries it is a relatively simple matter to expand or contract the warehouse space allotted to a variety of merchandise as circumstances demand, but with petroleum products this same flexibility cannot be made possible so readily or frequently. Marketing chemists impose stringent restrictions on the storage and conveyance of products to ensure that there is no contamination of one product by another or by other foreign substances. The operational people also impose on themselves certain safety restrictions. All this is done in the interests of the consumer to ensure that he receives his product to the standard which the industry sets itself, or to the specification required to operate the consumer's machinery to the highest possible efficiency, be it aircraft, marine engines, furnaces, or production machinery, etc.

### Main Types of Vehicles

The problem of limited flexibility again presents itself in the operation of road tank wagons, and consequently bulk vehicles are generally designed to four major patterns:

(1) Road tankers designed primarily to carry highly inflammable products such as motor spirits, these vehicles, of course, being constructed to comply with the earlier-mentioned Petroleum Spirit Conveyance Regulations.

(2) Road tankers designed to carry products other than highly inflammable spirits, such as fuel oils, gas oil, etc.

*Paper read to the Institute of Petroleum, Stanlow Branch, 24 September, 1954.

†Distribution Department, Shell-Mex and B.P. Ltd.

‡Mathias, T. W., *J. Inst. Petrol*, 1953, **39** (351), 125.

(3) Road tankers which are externally lagged with asbestos for conveyance of bitumen and very heavy fuel oils which, by their nature, have a slow rate of flow necessitating loading under high temperatures. This ensures that on arrival at the customer the products will flow from the road tanker without difficulty when assisted by compressor discharge.

(4) Highly specialized road tankers for the conveyance of lubricating oils, electrical oils, and bulk propane or butane liquid gases.

This limited variation in carrying types assists the despatcher to some degree to channel the orders he has received to the

*Fig* 3. *Scammell articulated* 13-*ton single-compartment bitumen vehicle with lagged tank and compressor for discharging load.*

respective types of vehicles. The marketing conditions for each product vary quite considerably, and technicians and operators are constantly researching into operating and marketing conditions with the objective of designing the right type of cargo tank to meet the selling requirements, in order to minimize possible underloading whilst using the largest capacity vehicle suited to a particular trade.

### Spirit Tankers

All spirit-carrying tankers have several compartments and until the very recent changes in the Petroleum Spirit Conveyance Regulations no compartment exceeded 600 gallons capacity—generally in the smaller capacity tankers the compartment sizes are varied. For example, a 1200-gallon vehicle might have four compartments, one of 500, one of 300, and two of 200 gallon capacity. Although these road tankers are built primarily to carry highly inflammable spirits, they can be and are used to carry a limited range of other products such as kerosines, diesel engine fuels, and gas oils. Orders for spirits, kerosines, derv, and gas oil will vary from 200-gallon lots and upwards, and it is the problem of the despatcher to make up loads for each vehicle by a combination of orders received from buyers, whilst not being able to mix products in the same compartment or sometimes in the same vehicle. It is not the practice to put motor spirit in one compartment and burning oil (paraffin) in another compartment on the same vehicle. Any contamination of the paraffin with motor spirit would have serious consequences. If this matter is given some thought the difficulties of the despatcher will be appreciated when he is dealing with, say, 200 orders a day for a range of products in a variety of quantities required over a wide area of delivery. This is quite a complex task when the pattern of the orders differs daily whilst the cargo tank and its compartments are unchangeable, especially as at the same time the despatcher is charged with operating the fleet with the maximum efficiency.

The smaller capacity spirit-type tanker is primarily used to deliver motor spirits to the filling station and to some commercial fleet owners. Buyers' storages in these cases are kept underground in compliance with licensing regulations imposed by the local authorities under the Petroleum Consolidation Act of 1928. In these deliveries the products are discharged into storages by gravity.

Many of these same vehicles, however, are equipped with a power pump which is brought into use when the products to be delivered are kerosines, derv, and gas oil, which, as far as the smaller consumer is concerned, are generally discharged into overground storage tanks, power-assisted discharge invariably being necessary. Farmers' storage tanks for their tractor vaporizing oil or gas oil are frequently located much above ground level so that they can fuel their tractors by gravity feed. Deliveries into these storages would be impossible without some mechanical aid such as a power discharge pump.

The larger-capacity spirit tankers, 3600-4000 gallons, have their greatest use in the movement of large quantities of aviation fuels to airfields, service and civil, where there are all the advantages of large storage tanks. These, too, are the tankers used for bridging supplies by road from refineries and main supply points to smaller distribution centres not situated on railway property.

### Fuel Oil Tankers

The second category of vehicle—the fuel oil tanker—has generally either a single-compartment or double-compartment cargo tank and has a power pump or compressor to assist discharging. It primarily delivers heavy fuel oils and other fuel oils for furnaces and power plants, gas oils for gas undertakings, and derv fuels for the larger passenger and commercial transport concerns. Most of the tonnage is conveyed in the largest possible tanker with a gross weight of 22 tons, giving a payload of approximately 13 tons of oil. These deliveries provide the best opportunities for efficient operation in that the consumers have large storage tanks—their requirements are generally known well in advance and frequently permit deliveries to be made throughout the day and night. With these large expanding concerns the best opportunities have occurred for the oil industry to equip itself with fleets of the largest possible road tankers and modern storage facilities. The progressive thinking of those same concerns in providing facilities in storage comparable to the equipment of the oil industry itself, has assisted at the outset in ensuring a continuing low distribution cost. Here is the lesson of the joint contribution of the supplier and the consumer in a common endeavour to assure the minimum final cost to the public of the manufactured article or the service provided.

### Lagged Road Tankers

The third category of vehicle—the lagged road tanker—has a single compartment and is equipped with a compressor unit. These tankers are mostly 13-ton-payload vehicles primarily used in delivering bitumen grades for use with road surfacing aggregates, on airfield runways, and in many industrial processes. The products are hot loaded at temperatures from 270° to 450° F. The temperature loss in transit under normal weather conditions is not more than 2° per hour. Consequently the products arrive at their destination still in a very fluid state for discharging by compressor into heated storages. The demands for bitumen products when used for roads or airfields fluctuate very appreciably as the requirements for these purposes are very much determined by prevailing weather conditions.

### Specialized Road Tankers

Road tankers in the fourth category are not so numerous as any of the other three main types. With the increasing range of products becoming available as the result of refinery expansion in the U.K., they are, however, increasing in number. Consequently the industry's technical experts are having to devote more of their time to designing these special vehicles, a task requiring highly specialized knowledge and much experience to meet the requirements of the operator and the marketing organization. The very nature of the special products to be carried demands the most meticulous care in the design of the road tanker to ensure that the product is in no way affected on arrival at the consumer's plant.

One company has now in service a number of 2000-gallon tankers specially provided for delivering electrical oils. Electrical oils are loaded dry, that is free from moisture, and must arrive at

the consumer to the same specification. Climatic conditions en route can and do affect the oil, but the provision of specialized equipment, which comes into operation during the process of delivering the oil, assures that the oil when put in the consumer's storage is in no way different from when it was loaded at the refinery.

Liquid propane or butane gas is commonplace today, but so far in the U.K. the movement of this product from the producing point to the consumer has been in specially constructed cylinders, the maximum capacity size being $1\frac{1}{4}$ tons. Developments are in hand to construct for the first time in the U.K. special bulk road tankers. The development in this field is not likely to be very great owing to the very high cost of storage and transport equipment against a foreseeable limited market.

### Packaged Products

Lubricating oils also require very special handling against the possibility of contamination and specially-designed road tankers are provided and kept exclusively for that trade. The greatest problem of the despatcher is the multitude of blends of lubricants and generally the quantities required are small in comparison with the other products distributed by the oil industry. Except for a few large concerns the individual requirements of each consumer are a matter of only up to 40 gallons of one blend. The very nature of the use of lubricating oils makes it impossible to envisage large-scale expansion comparable with fuels, and consequently the development of road tankers in this field has a limited application. Most of the consumers or retailers of lubricants must, therefore, continue to be serviced by deliveries effected in some form of small container or package.

The distribution of packed products is a very complex business. There are demands for all products in barrels of 40 or 50 gallons and there is still a use for 2-gallon cans, primarily for special spirits. Lubricants are distributed in a wide range of different-sized packages from 1 pint to 40 gallons. The end uses of packed products cover almost every conceivable industry, manufacturing process, and, in some cases, domestic application.

Because of the diversity of end uses and the different-sized packages, the opportunities to design a precisely efficient vehicle are very few. The make-up of orders varies appreciably day by day and orders have varying degrees of urgency.

### Articulated Vehicles

Whatever the road tanker employed or the product carried, the opportunities for back loads are very limited. There are some journeys and occasions when this is possible and the operators are ever on the watch for those opportunities in the interests of operational economy. The use of articulated tankers does, however, provide some opportunities for the pre-loading of spare tank trailers and for the changing over of trailers with a combination returning to the despatch centre. Spare trailers can assist in switching a tractor unit speedily from one product load to another as an alternative to providing separate complete vehicles. This has its greatest advantage at times of peak demand for different products, but there are economic limits to this method of operation.

The greatest advantage in the use of articulated road tankers is in the capital expenditure involved. With a rigid type of vehicle the life of the chassis would be anything up to ten years and in the purchase of a new chassis with its different and improved design it is often impracticable, technically and for other reasons, to remount the cargo tank on the new chassis, although the tank itself would perhaps last for another seven to ten years. A tractor unit and tank trailer combination can, therefore, be treated as two separate pieces of capital equipment, enabling the tractor unit to be replaced, say, every ten years and the trailer every 16-20 years, with a consequent reduction in the amount of capital to be provided for replacing these assets. An articulated tanker today costs no more than its rigid counterpart and the load equipment cost is approximately the same as the motive unit.

### Effect of Customer's Storage Capacity

The industry has constantly aimed at employing the largest number of the largest capacity vehicles and it has been highly successful in this direction where fuels are required for industrial processes and large transport undertakings. In the development and expansion of those industries the consumer has laid down sufficient oil storage tankage to ensure that he has adequate stocks to cover a reasonable period and so avoid any interruption to his plant or the services he provides. This matter of the consumer installing adequate oil storage is of considerable importance to himself. There can be circumstances outside the control of the oil industry which can cause an interruption in the flow of its products to the consumers. The consequences arising from the delay in resuming supplies to continuous manufacturing processes or public services need not be felt, or at the worst can be minimized, by the consumer having oil storage capacity to the extent of the quantity required for his use over an appreciable period of normal working.

It is, therefore, in the field of the road delivery of heavy fuels for furnaces, gas oils for gas companies, derv fuel for large transport concerns, and aviation fuels, that the greatest progress has been made in road tanker design.

The industry, however, still has to deliver some 50 per cent of its tonnage into storages which have in the main remained unchanged since their inception during the last 25 years, although the consumer requirements in that field have trebled. Consequently it is called upon to make prompt and frequent deliveries in order to uphold its reputation for providing an efficient service to the consumer. This service is still second to none. Despite these circumstances, the road delivery cost element in the price build-up is today roughly the same as it was in 1928. This is the measure of the achievement and typical of the progressive outlook of the industry in its desire to ensure that its products reach the consumer at the lowest possible cost.

Peak demands, primarily owing to climatic changes, strain road transport resources to their maximum. Fuels for heating reach their peak early in the year, motor spirits during the middle of the year, and some other products at varying periods. A great many of the peak and trough demands for different products are levelled out by the design and operation of transport to make vehicles as flexible as possible in their use over as many products as is practicable, with overall economic advantages. These practices have their limits and the best way to meet exceptional peak demands is for the retailer or consumer to provide himself with storage commensurate with his peak trade.

*Fig* 4. *A.E.C.* 4000-*gallon five-compartment motor spirit vehicle.*

The most aggravated example is the city shopkeeper selling paraffin and generally having about 50 gallons of storage. If there is an extremely cold snap in the winter, he sells out within an hour or two and then expects immediate replenishment. When his normal supply of 40 or 50 gallons is met from a road tanker he is again out of stock by the time that vehicle has served two or three subsequent and similar dealers, within a matter of two or three hours.

The stage has now been reached in which the industry will find it increasingly difficult, against an increasing demand for its products, to keep its road delivery costs pegged for this 50 per cent of its road tonnage unless the buyer or retailer plays his part in providing for himself larger tankage. Buyers and retailers have a responsibility to instal equipment which will ensure that the retailer's customers purchase their needs at the lowest possible cost and that the direct consumer is able to provide his manufactured goods at the lowest marketable cost.

The industry has had to re-plan and, in some cases, re-site its distribution centres in order to accommodate an ever-expanding trade and road fleet, particularly so that the turn-round of its vehicles can be unhindered and speedy. This involves high capital expenditure from which the economic advantages may not accrue until some ten years or more hence, but this is an example of the industry's progressive and forward thinking towards a continuing economic price for its products. Consumers, too, should have regard to the question of accessibility for the industry's vehicles

*Fig* 5. *The type of horse wagon in use in the early* 1900's.

when delivering their requirements. Solid products consumed by the buyer can generally be off-loaded from road transport almost anywhere convenient to the vehicle, to be manhandled or mechanically handled to the particular store or processing point. Petroleum products, however, can be discharged only at the particular point connected to the oil storage. Therefore, with an expanding consumption, although the consumer may equip himself with larger capacity storage, demanding deliveries in larger-sized tankers, those efforts will be negatived unless there is good accessibility to the storage point.

### Maintenance of Transport

A very high standard is set and obtained in the mechanical maintenance of the industry's road fleet. Weekly general maintenance is carried out on all vehicles at the operating centres. Vehicles are inspected by competent mechanics at prearranged regular intervals and defects cleared promptly. Major overhauls are programmed well in advance of due dates so that the repair organization can ensure that a great deal of the usual replacement units or spares are available for the vehicle when it arrives.

It is to be noted that the fact that loads are carried in non-expandable tanks obviates overloading and consequently the chassis of the vehicles are not likely to suffer abnormal deterioration arising from the effects of the payload.

A great deal of importance is attached to the paintwork of vehicles, which is maintained at a high standard. This, however, does not imply that unnecessary costs are incurred, rather the reverse in that the methods employed have been formulated over years of experience and have proved to give superb results economically.

### Labour Relations

Labour relations machinery in the industry is probably the best of its kind in the U.K. Soon after the Petroleum Board was formed at the commencement of the last war, the industry entered into an undertaking with the Trade Unions to set up a consultative constitution for the operatives in the industry. Subsequently a panel of the employers together with a panel of an equal number of representatives of the operatives, drawn from the Transport and General Workers' Union, formed a Conciliation Committee. This same committee constitution carried on following the emergence from the Petroleum Board of the oil companies' representatives under their individual trading identities.

Each panel has its secretary and meetings are convened by either secretary when required to discuss any matter which either panel desires to be considered. Matters raised by either panel of the Committee are exhaustively examined by both parties in a genuine desire to see if the requirements can be met in full or, perhaps, the extent to which they can be resolved. At these meetings there is a completely frank exchange of views with a common endeavour to promote the interests of the operatives, whilst at the same time accepting the responsibilities inherent in these matters in the interests of the consumers and the national wellbeing of the country.

The constitution also provides for works committees at all operating centres, and meetings are held regularly each month. All operatives covered by the Conciliation Agreement are represented on the works committee, the number of representatives depending on the number of operatives at each employing centre. The works committee machinery follows the constitution laid down between the panels of the Conciliation Committee, due regard being paid to the structure and organization of the company concerned. Operatives advise their representative secretary of any matters they wish to be raised and an agenda is prepared in good time for the next meeting. Should there be an item or items on the agenda of a nature requiring the local management to seek the policy or views of a higher authority, then this is obtained in time for the information to be imparted to the meeting. This constitutional procedure, however, in no way supersedes the right or opportunity for any operative to see his manager, should he wish to do so.

The chief aim of works committees is to endeavour to resolve matters at their local level to avoid invoking the procedure machinery up the line to the highest level. In the event of a subject raised by the operatives not being resolved at that meeting, the next step is for a joint discussion between the local manager and the local Trade Union official. Should it still not be possible to reach a conclusion locally, then it is referred to the Head Office of the Company and the central office of the Union so that they may meet and endeavour to clear it. If it is not cleared at this level it then becomes a matter to be tabled before the full Conciliation Committee. The next stage beyond this is to refer it to the Ministry of Labour with the object of submitting the point at issue to an independent arbitrator.

Minutes are made at each meeting of works committees and copies are passed to divisional area headquarters. They in turn make extracts of important items and matters of general interest and pass them to their head office. The Trade Union officials are also in frequent touch with their representatives located in or near the operating centres.

This system ensures that both panels of the Conciliation Committee are as well in touch with their operatives and members as can reasonably be expected, having regard to the diversity of the functions of the operatives in the industry and the wide area of its operations.

Finally, the procedure machinery for tabling and investigating problems or other matters is adequate and competent, and none of these need remain unresolved.

### Costing Problems

The road fleet in the industry conveys about 15 million tons of products in a year, running some 130 million miles to do so; giving about 600 million ton-miles. The replacement value of its

road fleet would probably be about £16 million with an annual replacement expenditure of approximately £2 million.

More than 40 per cent of the fleet operating costs are drivers' wages, about 13 per cent are other standing charges, including depreciation, and the balance of over 40 per cent is incurred as running costs for repairs, tyres, fuels, and lubricants.

Obviously costs have always been of importance, but with the ever expanding use of products of a greater variety for a wider range of end uses, attention to the need to cost more scientifically has become of much greater importance.

The use of a road tanker for delivering a range of products in order to keep transport costs to a minimum by making the fullest use of equipment and labour, has the effect of showing that in a particular accounting period a vehicle has delivered varied total quantities of a range of products. Merely to apportion the total cost relative to the differing quantities of products carried would not be accurate. There is a difference in the mileage and time effort involved in delivering different products, which is influenced also by their density and where they lie geographically. In some cases the differences are quite appreciable.

If delivery costs are to be realistic enough to enable the marketing side to make a true assessment of the selling prices, it is necessary to ensure that the true delivery cost of a product is obtained. There is no difficulty in obtaining a true cost for a product if there is no need to take account of the clerical staff employed or the amount of paper used. This, however, cannot be so, for in the field of costing it is important to endeavour to produce what is required with an absolute minimum of effort and paper.

It is in this important field of marketing organization that the skilful experience of the cost accountants combines with the knowledge and the "on the ground" experience of the fleet operators to produce satisfactory systems which will channel operating costs equitably to the many varied products.

The industry's experts are constantly researching for improved administrative methods in order to provide costs and statistics not only for accountancy and marketing purposes, but also to assist and direct fleet operators in achieving greater efficiency in road transport operating methods, with a resultant favourable effect on the final road delivery cost.

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# U.S. Petroleum Refineries

On 1 January, 1954, the total crude-oil throughput capacity of the 337 refineries in the U.S.A. was 8,006,897 b.d., with a further 397,500 b.d. capacity under construction. Actual operating capacity was 7,782,103 b.d., or about 97.2 per cent of installed capacity.

In the report* covering this subject, details are given of location and ownerships of individual refineries. Information regarding previous years from 1914 indicates that on 1 January, 1936, the total number of refineries in existence was at the peak of 632, with a total capacity of 4,117,047 b.d. Of these, 422 were in operation and had a capacity of 3,749, 835 b.d.

Data for the last five years are extracted in Table I.

TABLE I
U.S. PETROLEUM REFINERIES

| 1 *Jan.* | *Number* | | *Crude Oil Capacity, b.d.* | | | |
|---|---|---|---|---|---|---|
| | *Optg.* | *Total* | *Optg.* | *Shut-dn.* | *Total* | *Building* |
| 1950 | 320 | 367 | 6,222,998 | 473,302 | 6,696,300 | 145,600 |
| 1951 | 325 | 357 | 6,701,815 | 261,829 | 6,963,644 | 160,100 |
| 1952 | 327 | 350 | 7,161,366 | 171,519 | 7,332,885 | 282,680 |
| 1953 | 315 | 343 | 7,481,701 | 156,960 | 7,638,661 | 509,721 |
| 1954 | 308 | 337 | 7,782,103 | 224,794 | 8,006,897 | 397,500 |

It is noted that 70 per cent of the operating refinery capacity at 1 January, 1954, was concentrated in four districts, viz: Texas Gulf Coast (1,839,000 b.d.), Indiana, Illinois, Kentucky, etc. (1,452,300 b.d.), California (1,198,220 b.d.), and East Coast (1,133,533 b.d.).

It is also shown that the largest refineries in terms of crude-oil operating capacity were:

| | B.d. |
|---|---|
| Esso Standard Oil Co., Baton Rouge | 266,475 |
| Humble Oil and Refining Co., Baytown | 260,000 |
| Gulf Oil Corpn., Port Arthur | 245,000 |
| The Texas Co., Port Arthur | 210,000 |
| Shell Oil Co., Wood River | 170,000 |

and that the five largest refining companies, on a similar basis, were:

| | B.d. |
|---|---|
| Esso Standard Oil Co. | 551,375 |
| The Texas Co. | 531,600 |
| Shell Oil Co. | 479,000 |
| Sinclair Refining Co. | 425,000 |
| Gulf Oil Corpn. | 393,133 |

### Cracking Capacity

During 1953 cracking facilities to produce cracked gasoline rose by 4.6 per cent to 2,249,464 b.d. on 1 January, 1954, when 253,191 b.d. additional capacity was under construction. The operating percentage was 97.4 against 97.7 a year before. A summary by types for the last five years is given in Table II.

TABLE II
U.S. CRACKING PLANT CAPACITIES IN BRL/DAY

| 1 *Jan.* | *Types of Plant* | | | |
|---|---|---|---|---|
| | *Reformed* | *Thermal*† | *Catalytic* | *Total* |
| 1950 | 307,007 | 784,621 | 729,055 | 1,820,683 |
| 1951 | 295,500 | 776,796 | 780,810 | 1,853,106 |
| 1952 | 333,703 | 774,696 | 907,544 | 2,015,943 |
| 1953 | 355,297 | 789,558 | 1,005,602 | 2,150,457 |
| 1954 | 414,358 | 727,183 | 1,107,923 | 2,249,464 |

†Includes some reformed and catalytic.

Based on the criteria of total operating capacity for cracked gasoline, irrespective of type of operation, the largest plants were:

| | B.d. |
|---|---|
| The Texas Co., Port Arthur | 86,000 |
| Esso Standard Oil Co., Baton Rouge | 61,780 |
| Sun Oil Co., Marcus Hook | 55,000 |
| Humble Oil and Refining Co., Baytown | 54,500 |
| Esso Standard Oil Co., Linden | 53,160 |
| Shell Oil Co., Wood River | 47,500 |

*"Petroleum refineries, including cracking plants, in the United States, January 1, 1954". J. G. Kirby, *U.S. Bur. Mines Inf. Circ.* 7693. July, 1954.

# Around the Branches

FAWLEY, LONDON, NORTHERN, PERSIAN GULF, SCOTTISH, SOUTH EASTERN, SOUTH WALES, STANLOW, TRINIDAD

### Persian Gulf Branch—Kuwait Sub-Branch

The activities of the Kuwait Sub-Branch during August included a film show on 4 August. Film shows have become a popular feature and the films shown were—Oil Reviews 16 and 17—"The Island" and "Warm Welcome".

At the meeting held on 23 August, G. A. Lee presented a paper, written in conjunction with J. S. Gerrard, on "Some Basic Corrosion Problems in Kuwait and their Control".

The speaker was introduced by J. M. Dougary, vice-chairman and acting-chairman during the absence of V. J. Chir on leave. Mr Lee said that in spite of the lack of rainfall in Kuwait corrosion had been relatively severe, with an important exception in the case of equipment in contact with crude oil. Except in the case of the very early installations, much attention had been given to corrosion prevention measures. These included coating, repairing, painting, and cathodic protection, etc.

The oil loading and cargo handling jetty, an all-steel construction, had been adequately coated with a coal tar preparation applied hot before erection, but the barnacle damage experienced had necessitated adoption of a magnesium anode cathodic protection system. This had proved completely satisfactory in preventing underwater corrosion, but protective potential was also currently maintained, in part by forced drainage from rectifiers and scrap metal ground-beds. Forced drainage methods were also employed for submarine loading lines.

Certain pipelines were already protected by magnesium anodes and more were to be protected by this method. One coated and wrapped 16-inch line, approximately 9.2 miles in length, was protected by groups of anodes located in a small saltflat about midway along the pipeline.

Natural current flows had been detected in all steel pipelines and between two and three amps had been found to be flowing into every well head from connected buried and surface pipework. Such flows had been interrupted by appropriate insulating flanges.

Mr Lee went on to say that the corrosion of cast iron in sea water service had been very pronounced. Graphitization to the extent of 0.51 inch after 3.5 years' service had been found in a cooling sea water line. In part of this line an internal cathodic protection system employing graphite anodes had been installed on trial and had provided data for a comprehensive scheme.

Severe underwater corrosion of certain barges (causing pits 0.125-inch deep in plate 0.375-inch thick after twelve months) had prompted their cathodic protection by magnesium anodes.

Treatment of potable water supplies had been found necessary in order to prevent internal corrosion of pipelines and consequent "red water" epidemics.

Mr Lee concluded by saying that he hoped that the details he had given had shown that a corrosion engineering section was an integral part of an oil company's organization.

### Scottish Branch

A meeting of the Scottish Branch was held in the North British Station Hotel, Edinburgh, on 23 September, 1954 at 7.30 p.m.

J. M. Caldwell, chairman of the Branch, introduced the speaker, Miss G. M. Mitchell, M.A., LL.B., H.M. District Inspector of Factories. He said that Miss Mitchell had had long and varied experience as an Inspector of Factories in Scotland and England and was, therefore, well qualified to speak on her subject—"The Factories Acts 1937 and 1948 as they Affect the Chemist and the Plant Engineer". Her address was most interesting and informative and was followed by a lively discussion.

At the conclusion of the meeting Mr Caldwell proposed a vote of thanks to the speaker to which members heartily responded.

### South Wales Branch

The first meeting of the 1954-5 session was held at the Training Centre, National Oil Refineries Ltd., under the chairmanship of J. A. Green, when the Branch was honoured by having as the speaker Colonel S. J. M. Auld, O.B.E., M.C., D.Sc., President of the Institute.

The President spoke on "Internationalizing Petroleum Technology". He emphasized the fact that the oil industry knew no boundaries, and spoke of the part played by the World Petroleum Congresses.

At the close of the meeting a vote of thanks was proposed by R. B. Southall and heartily accorded.

### Trinidad Branch

On 6 August a talk on "Instrument Practice" was given by E. L. Lloyd. J. A. Hulme was in the chair.

After briefly outlining the growth of instrument usage in the last thirty years, a period in the oil industry when batch processing gave way to continuous processing, Mr Lloyd discussed the various means and limitations of measuring temperature, flow, and pressure. Speaking, for example, of gas flow measurement, he said that although it was very widely used, it should be realized that variations in density, static pressure, temperature, and orifice accuracy, to say nothing of humidity and planimetering, all affected the orifice coefficient, and results should be accepted with these probable errors in mind.

The future of electro magnetic and sonic flowmeters and their limitations were also discussed under the general theme of "electronics in industry".

Finally, the speaker described electric strain gauges and load cells as alternative methods for determining the dead weight on drilling rigs and suggested that general instrumentation on such rigs should be re-appraised in the light of modern instrument practice.

The 138th general meeting of the Branch was held at the Apex Club on Friday, 10 September, 1954, when S. T. Waite presented films showing the preparations for drilling the marine well of Trinidad Northern Areas Ltd. in the Gulf of Paria—the first marine location in Trinidad waters—located some 14½ miles from Point Fortin and 6 miles from Cedros Point.

Before presenting the film, Mr Waite briefly described the conditions under which the photography was taken, and L. Allcock, who subsequently gave a running commentary during the presentation, then gave a short talk on the history of the operations and dealt with the main facts of interest.

Mr Waite's film of this important project was greatly appreciated by the large audience, and at the conclusion he and Mr Allcock were called upon to answer many questions.

# The Council of British Manufacturers of Petroleum Equipment

## Possible Link with IP Foreshadowed

"As we look upon the oil world as the market for our products, it is fitting that this gathering should be strongly international and the Council is deeply conscious that its influence in all these directions appears to be respected. For this reason, we derive considerable encouragement in our efforts for the future," said Douglas Wilson, chairman of the CBMPE, at its Annual General Meeting Luncheon in London on 30 September.

After welcoming the guests, Mr Wilson said there was tangible evidence of the versatility and comprehensiveness of the British petroleum equipment industry in the Council's Classified List. They were convinced that British-built equipment was second to none and, with materials becoming more readily available, they had confidence that delivery promises could be reasonably kept.

*Douglas Wilson* (right), *chairman of CBMPE, greets the principal guest and speaker at the Annual Lunch, Colonel S. J. M. Auld, President of the Institute —*

Referring to the part research would take in their future policy, Mr Wilson said that distinguished scientists had been invited there so that they might be told something of the Council's aims and objects and reminded that the petroleum industry was virile and progressive. He wanted them to impress their students and others with the urgency of a more intensive interest in petroleum technology.

The Council was not constituted to carry out research but he believed they should help, where help was possible and welcome. Many discussions had taken place and the time was approaching when they would be able to formulate more precise plans. Mr Wilson concluded: "I can assure all those interested, and there must be many, that we, on our part, will do our utmost to participate in any joint action which may emerge from our present negotiations."

Col S. J. M. Auld, O.B.E., M.C., D.Sc., President of the Institute of Petroleum and an Honorary Member of the CBMPE, replying on behalf of the guests, said there was no doubt of the success the Council had achieved. The present membership was 407 firms of repute and substance. As suppliers to the oil industry at home and abroad they formed a very powerful part of British industry—and a great national security.

Referring to the development of petroleum refining in the U.K., which had risen from a capacity of 2½ million tons in 1944 to 29 million tons to-day, Col Auld said it was apparent that the country was becoming continuously more oil-conscious.

The U.K. was not an oil-producing country but had done wonders in initiating petroleum refining on that scale, and with its allied engineering. But it might be that the anchoring of petroleum as a major engineering thought of the U.K. was still to be accomplished.

Continuing, Col Auld said: "Present programmes are nearing completion . . . European countries are anxious to build for themselves; international competition is already affecting markets we thought our own; and the corresponding competition amongst ourselves is drawing somewhat at our entrails."

The Council was watching the position closely and Col Auld said that in his view world consumption and production of petroleum would continue on its present upward curve and would approximately double in the next 12 years. The future was safe, they could back the oil side of the oil industry, and he knew of little in the way of petroleum equipment which could not be made, which was not made, and which was not best made in Britain.

The fact should be established that the Council was as much a part of the oil industry as the oil companies themselves, and a more intimate alliance between the Council and the companies would be a good thing. Obviously, the two branches could be linked through that progressive and professional body—the Institute of Petroleum.

Research had been mentioned as an important form of activity and he felt one might say: "Let us carry out research and invent our own processes." That had much to commend it

*— who is seen here addressing the assembled company.*

for, by process research or operational experience, there was little doubt that the strengthening of a process would quickly expand the orders placed in the U.K. for oil equipment.

Equally important joint action between the two branches would be in the field of public relations "to make petroleum part of the blood and bones of the community".

Concluding, Col Auld said: "The Institute of Petroleum, therefore, offers to the equipment branch of the oil industry the same co-operation and service as it gives to the production, process, and application side. It is well-fitted for the purpose. Among the most active sections of the IP are the very ones of which the Council seems mostly in need—the Public Relations and Research Committees, the Engineering Committee, and the Education Committee. Through such a set-up, joint discussion can lead to joint action."

### The Chairman's Report

In his report for the year 1953-4, the Chairman of the Council, Douglas Wilson, noted that a recent authoritative forecast had suggested that within the next 25 years oil consumption would reach 1500 million tons and that capital expenditure of £2000 million per annum for the next 20 years would be required to meet the demand so far as the free world was concerned.

Points from the report are summarized below:

The Fédération Européenne des Constructeurs d'Equipment Pétrolier, with initial membership covering the U.K., Belgium, France, Germany, Holland, and Italy, had been constituted as a non-trading body devoted to the international development of petroleum equipment in the free countries of Europe.

Members would have the opportunity of supporting the Fourth World Petroleum Congress.

Long-time process research was part of their next objective and there was a definite research flavour in the 1954-5 programme.

A "Chemical and Petroleum Engineering Exhibition", organized jointly with the BCPMA, is planned for June 1958 at Olympia, London, and thereafter in a four-year sequence.

Members were making increasing use of the Technical Services of the Council, and they had been fortunate in securing the services of Cecil W. Wood to relieve Mr Bonstow of the preparation of the Technical News Summaries.

A new edition of "British Petroleum Equipment" was expected in April or May 1955.

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# Books and Films

### BSI Annual Report

In its Annual Report for 1953-4, the BSI notes that, consequent upon the re-calculation of the viscosity of water, an amendment to BS 188 was issued and a general revision of the standard was under consideration during the year in collaboration with the IP. Work in hand included revisions of BS 210 (Classification of lubricating oils) and BS 489 (Turbine oils), and the preparation of a standard for refrigerator oils.

Under the heading of petroleum equipment, it is noted that standards have been issued for flanged ferrous valves, and for the first of a series of domestic kerosine appliances. Many other matters concerning equipment for use in the petroleum industry are under consideration.

All existing specifications for mastic asphalt are likely to be revised and a model specification is being drawn up to ensure co-ordination.

Copies of the report are available from the BSI, 2 Park Street, London, W.1., 5*s* net.

### "Western Canadian Oils"

The 1954 version of this annual, of which it is the eighth edition, serves a dual purpose in that not only does it give details of over 200 companies operating in Western Canada, but it also includes much data on the oil industry of that area. Thus, it gives statistics of production, of refining capacity, and of natural gas. It also has a map covering general oil and natural gas developments in Alberta, Saskatchewan, and Manitoba, and individual maps of various oil and gas fields, as well as a glossary of oil terms relating to field operations.

"Western Canadian Oils" is published by James Richardson & Sons, American and Overseas Dept., Royal Bank Building, Toronto 1.

### Literature on Fires

A valuable guide to the scientific literature on fire published mainly during 1952 has been issued by the Fire Research Organization, Boreham Wood, Herts, under the title "References to Scientific Literature on Fire. Part V2. 1952". The authors, Miss E. M. Shakeshaft, Miss B. F. W. Baxter, and Miss I. G. Wolanska, have collected together references to 651 articles and patents and classified them according to their scope. A detailed index facilitates reference to specific subjects.

### Diesel Maintenance

With the ever-increasing use of diesel power units in road vehicles of all classes, and particularly in light delivery vans, taxicabs (over 1000 of which in London are diesel driven), etc., the latest film produced by Shell-Mex and B.P. Ltd., is of considerable importance. *You and Your Diesel* is its title and, although it is aimed at the owner of the small fleet, it will also be of interest to the chief engineer of the larger fleet. In 34 minutes it tells the story of the owner who thought he could not afford the time to have his vehicle off the road for checking and maintenance. Eventually, when his vehicle could be "passed by an old lady in a bath-chair", he had to have a complete overhaul and the reasons are clearly shown in the film.

*From the Shell-Mex and BP film* You and Your Diesel, *John Lawrence examines Sam Grimshaw's engine and is appalled at the sludge caused by the use of the wrong type of engine lubricant.*

Copies of the film, in 35mm and 16mm form, are available on loan from the Company as usual.

# Development of the West German Chemical Industry Since 1945*

*By* DAVID LEE† *and* TERENCE D. O'KEEFFE†

The subject of this paper is much too wide to allow exhaustive treatment and so will be restricted to discussion of some of the highlights in the post-war history of the German chemical industry, and some popular misconceptions about it.

A comment was recently published on these lines: "In spite of the complete shattering of the German industry, in spite of the dissolution of the IG Farben chemical complex, and in spite of the post-war ban on chemical research, the German chemical industry had made a most remarkable recovery and has now reached a production index of over 250 per cent". This sentence contains no less than four misleading or completely erroneous statements.

"The complete shattering of the German industry": whilst it is true that in common with the rest of industry and indeed with national life in general, the chemical industry was in a chaotic state upon the cessation of hostilities in 1945, it can only be said to have been shattered in a metaphorical sense. As regards the literal shattering, that is to say by Allied air bombardment, it must be recognized that a chemical plant is a very difficult thing to destroy. Viewed purely as a target, a chemical factory consists of a number of buildings containing lumps of metal in the form of vessels of various shapes and sizes, joined together by a system of pipes, and with an electric motor or two scattered around! Whilst it is certainly possible, with a few well-placed high explosive bombs, to demolish the buildings, break some of the pipes, and perhaps dent some of the vessels, it is very difficult indeed literally to destroy them beyond hope of repair.

Recently Herr Menne, the President of the German Chemical Manufacturers Trade Association, said that the replacement value of the German chemical industry was at least DM.15,000 millions, or more than that of the whole coal mining industry of West Germany; repairing of war damage had required an investment of about DM.3000 millions. It would seem then that the German chemical industry was about 20 per cent damaged at the end of the war; a considerable amount, but by no means "completely shattered".

With regard to the IG, to which reference will be made again later, it is certainly true that the IG Farben Industrie in West Germany has been divided into smaller units, but it is important to bear in mind that the IG Farben Industrie which has been split up is only 36 per cent of the original complex; 38 per cent lies in East Germany, and the balance, *i.e.*, 26 per cent, was in foreign countries.

Post-war research: it is by no means true that research was absolutely forbidden in Germany after the war. Research, including pilot plant work, was forbidden on certain commodities finding applications only in war, *e.g.*, war gases and bacteria, and research was controlled on certain other commodities which find great application in war but have also valuable peace-time purposes, for instance phosphorus and hydrazine. Somewhat similar controls were placed on production; it was, for instance, forbidden to produce hydrogen peroxide above a given concentration. It is the authors' belief, however, that the research and production controls were resented by the Germans more for their mere existence than for any major hindrance which they exerted on industry.

The point of production index (250 per cent) is one which occurs all too often in post-war years and there is constant difficulty in reconciling apparently irreconcilable statistics from various sources.

It is the habit in United Kingdom and United Nations publications to base production statistics as percentage increases on production in 1948, but it is impossible to obtain a real picture of recovery in the West German chemical industry using this year as a norm. From 1945 until 1948, currency in Germany was worth very little more than the paper it was printed on, and 1948 was the year of currency reform. To obtain an accurate picture one must take the last normal pre-war year, 1938, as a basis for comparing West Germany's chemical production with that of other countries. If one does this, the chemical production index of the U.S.A. for December 1952 based on 1938 equals 100 is 318, France 144, Italy 166, United Kingdom 265, and that of West Germany 135.

It may appear, therefore, that the actual extent of recovery of West Germany's chemical industry is not so high compared with some other countries: what is more impressive is the *rate* of her recovery. In 1948, the index of chemical production in the U.K. (again on the basis of 1938 equals 100) was 195, in the U.S.A. 253, and in France 114, whilst that for West Germany was only 59. In other words, Germany has had further to go since the war than her competitors. The rate of the recovery has been maintained and even increased; the index in August 1953 was already 150. In the U.K. and the U.S.A., however, the indices have levelled out and even receded somewhat.

### West Germany's Post-War Difficulties

In the authors' opinion, the three great burdens which the chemical industry has had to bear are the splitting of Germany into the Federal Republic and the Eastern State, the loss of patents and trade-marks, and the dissolution of the IG Farben complex.

There are large German chemical works in Middle and East Germany which were, prior to the war, important suppliers of chemical primary products to West Germany, and in the industrial areas of Saxony and Silesia there were important markets for consumer goods. Trade with East Germany is now regulated, as is trade with all countries of the Soviet bloc, and the West Germans complain that the severe way in which their trade is controlled, compared with the loose way in which the trade of other countries is regulated, amounts to discrimination. The point here is that whereas other Western countries, having entered into a joint agreement to do so, themselves regulate their trade with the East, West Germany's trade is regulated for it by the Occupation Powers. This may possibly make a difference, though in theory it should not.

### Confiscation of Patents and Trade-marks

On the outbreak of war all enemy property, which included patents and trade-marks, was confiscated and placed in the hands of the Custodian of Enemy Property in the U.K., and of similar organizations in other Allied countries. These enemy

*Condensed from a lecture given in February 1954 to the Birmingham University Chemical Engineering Society.

†George Lewi and Partners.

assets were disposed of by the Custodian at his absolute discretion and the proceeds were applied towards reparations. In non-belligerent countries, German patents and trade-marks were freely pirated and although in theory Germany has the right of appeal to the International Court at the Hague for redress, this course in practice is unlikely to prove worthwhile as such an appeal could not be made effectively until Germany again becomes a sovereign state, by which time most of the patents concerned will have expired and proceedings would, in any case, be tedious and costly.

The confiscation of Germany's patents and trade-marks has undoubtedly been a blow to the country and is estimated by the Germans as representing a loss of invisible exports, largely to hard currency areas, of about DM.1000 millions yearly. While this figure cannot necessarily be endorsed there has certainly been a very real loss of profits which might have been made. In addition there is the damage to the reputation of German manufacturers by the marketing of poor quality goods under their former trade-marks and, occasionally, by companies which were previously German-owned and still retain their original trading name.

Without commenting on the moral aspect of the decartelization of the IG Farben complex, it can be said that it has certainly reduced turnover in the West German chemical manufacturing field and has also, owing to the post-war uncertainty of the ultimate fate of the various works, made long-term planning very difficult.

### Financial Difficulties

The West German chemical industry has finance and taxation difficulties of a sort all too familiar in Britain. Investment in the chemical industry since the time of currency reform has not been particularly high and has come only to an extent of 10 per cent from private or state sources, the balance being from revenue. International competition is now so great that in Germany, as in Britain, the continued financing from revenue is no longer possible. The leading West German chemical companies have recently altered their dividend policies in an attempt to attract private capital, but this has largely been negatived by the high rate of taxation.

A recent tax reform, however, allows progressive amortization of capital plant.

The investment plan for the West German chemical industry over the next few years will require at least DM.500 millions annually for new plant. The new plants envisage an expansion of production of synthetic fibres, synthetic resins, and the light metals, and the recovery of rare metals from ash and gaseous effluents. In addition, in order to meet international competition, there will be a partial change from coal to oil as a raw material for organic synthesis, and the investment required here will be considerable for the first three to four years.

Before the first world war about 30 per cent of the chemical products traded internationally were produced by Germany; by the second world war, the figure was 25 per cent and today for West Germany it is about 10 per cent. Although Germany has lost some ground between the two world wars, and was at a considerable disadvantage in 1945, the chemical exports today are by no means negligible and indeed West Germany now ranks third in world trade; in volume of exports she had by 1951 equalled her 1938 performance. Moreover, the rate at which her exports are increasing is such that she is likely to overtake the U.K. during this year or next.

### Recovery of West German Chemical Industry

The remarkable recovery of West Germany's export trade in chemicals is based on three factors. First, West Germany is very progressive in production methods and can thus offer on the world market basic chemicals at competitive prices. Secondly, West Germany is able to offer a complete range of products, which is of major importance in international competition. Moreover, the West German chemical industry, particularly the middle- and small-sized undertakings, shows much ingenuity in developing new lines. Indeed at the moment 20 to 30 per cent of the total turnover of this size of firm is of products that were not manufactured in Germany five years ago. These new products are principally in the fields of synthetic resins, man-made fibres, pharmaceuticals, textile auxiliaries, plant protective media, and photographic goods.

The third factor influencing West Germany's export recovery, and one which might well be copied in England, is the intensive study of foreign markets which is carried out in West Germany. A good deal of money has been devoted to this in post-war years and a great many leading West German personalities have made study journeys. This expense seems now to be proving its worth. In addition, the German exporters take the utmost care and give detailed attention to even the smallest of orders. Proofs of this are the re-entry of West Germany into the Central and South American markets and the success of their export drive in the Middle East.

Germany has long been a pioneer in the extraction of chemical products from coal. The production of coke, crude tar, crude benzene, naphthalene, tar oil, and coal-tar pitch, has continued to rise in the post-war years. Long experience has taught the Germans how to make the maximum use of coal and its derivatives and there is no doubt that large-scale organic synthesis in Germany will continue to be based principally upon coal as a raw material.

However, increasing international competition in the last two years, coupled with the rising cost of coal in Germany, have made it clear that for certain applications mineral oil is a more economic raw material and this has led to the foundation of a petrochemicals industry in West Germany. A new company "Rheinische Olefinwerke G.m.b.H." at Wesseling, between Bonn and Cologne, has recently been formed jointly by the BASF and Deutsche Shell.

The new company is to start immediately on the erection of a plant for the production of polyethylene and ethyl benzene based on refinery gases from the petroleum refinery at Wesseling. The polyethylene production will be sold under BASF's trade mark "Lupolen", while the output of ethyl benzene is probably to be used in the manufacture of polystyrene. Production is expected to start in 1955 and the project promises to be one of the largest petrochemical undertakings in continental Europe.

The Bergius hydrogenation process for coal seems now to be on the decline though three plants are being operated by Scholven AG, Bottrop Ruhroel, and Gelsenberg Benzin. Hydrogenation of petroleum residues is preferred and part of the large former Hermann Goering works at Wesseling is now under lease to some of the oil companies for this purpose; Gelsenberg Benzin is also hydrogenating mineral oil as well as coal.

### The Fischer-Tropsch Process

Aside, perhaps, from the introduction of new fibres, in which Germany is trying to gain the lead, the most significant post-war development programme has been on the Fischer-Tropsch process. The Allied prohibition on the operation of Fischer-Tropsch units was not lifted until the latter part of 1951, but since then the former Krupps Bergkamen plant has been modernized and put back on stream and four other plants are being or have been rehabilitated. When all are on stream there will be an annual production of about 150,000 to 180,000 tons per year of primary products.

Ruhrchemie was among the pioneers of the Fischer-Tropsch process and during the post-war period when such plants were not permitted to be operated, the Company carried out research work on coal gasification and the Fischer-Tropsch process on an extensive scale, in conjunction with Lurgi. Remarkable improvements in space-time yield, catalyst life, and quality of product have been achieved as a result of this research. One of the major results of this programme was a contract to build in

South Africa a plant for 200,000 tons of liquid fuel per year. Some American companies, *e.g.* Kellogg, are participating in this programme as contractors and the cost of the plant is to be something in the neighbourhood of £20 million.

Following post-war research on the Fischer-Tropsch reaction, gasification under 20- to 30-atm pressure with steam and oxygen through a fixed coal bed is the preferred process, being cheaper under German conditions than using powdered coal and oxygen. Lurgi has developed a gas purification process, known as the "Rectisol" process, which is low-temperature solvent extraction ($-40°$ to $-60°$C) and in one step accomplishes what formerly required five steps; dry oil scrubbing, pressure absorption of $CO_2$, removal of $H_2S$, activated carbon scrubbing, and final hot purification over alkaline iron oxide to remove organic sulphur. This process is to be incorporated in the South African plant but, in the opinion of the Lurgi workers, it is economical only in conjunction with large-scale pressure gasification.

Fischer-Tropsch development has deviated from American practice in that a fixed-bed catalyst is preferred to a fluidized catalyst; however, as in the U.S.A., iron has replaced the original cobalt catalyst. Recent information published on the Fischer-Tropsch process shows that the catalyst life, cooling surface, and reactor size, have been improved remarkably over war-time performance, and also that under these modern operating conditions a much higher yield of high melting waxes is obtained.

However, the economy of such a unit depends to a considerable degree on the price that can be obtained for the waxes. If the market were saturated with these products, a Fischer-Tropsch unit of this type might no longer be economic. It is believed that in Germany it will be possible to manufacture petrol at a cost one-third cheaper than that of imported petrol; the octane rating of petrol now obtainable from the Fischer-Tropsch process is up to 78 before addition of tetraethyl lead, etc.

### Synthetic Rubber Production

The state-assisted development of synthetic rubber led to the building of a pilot plant in Schkopau in 1935 which was later expanded to a production unit for 30,000 tons of buna per annum. Schkopau was chosen because the nearby brown coal mines ensured cheap power for the carbide furnaces, and the adjacent Leunawerke of the IG could supply cheap hydrogen. In 1938, on the basis of the experience obtained in Schkopau, a buna factory was erected at Huls. Acetylene was obtained by cracking, in an electric arc, hydrogenation waste gases from the nearby Scholven hydrogenation plant, which gave simultaneous production of carbon black and hydrogen. Both this factory and the Schkopau plant worked on the four-stage synthesis: acetylene—acetaldehyde—aldol—butylene-glycol—butadiene.

In 1942 a third buna works was built in Ludwigshafen using the Reppe-process for butadiene manufacture. By the end of the war, however, buna production was given up and the plant turned over to other products of high-pressure (Reppe) acetylene chemistry.

Production of buna recommenced at Huls in 1951, part of the butadiene going to Bayer at Leverkusen for perbunan (acrylonitrile co-polymer). In 1952 and 1953 Huls extended its production, producing not only polymerized butadiene but also a series of butadiene-styrene mixed polymers of which perhaps the best known are "Lipolit" and "Duranit".

The authors believe that Huls still work the four-stage process for butadiene synthesis though they have the intention of changing to a more modern process. They still manufacture their acetylene by electro-thermal cracking of gaseous hydrocarbons, though their source of raw material is now natural gas which is piped 80 km from Bentheim, on the Dutch border.

### Production of Synthetic Fibres

Following IG Farben developments on polyamides during the war, "Igamid", polyamide fibres have found a large market in post-war Germany. The Farbenfabriken Bayer, at its works in Dormagen, produces Perlon staple, monofilament, bristle fibre, and also grades for technical purposes (gears and other mechanical parts). Perlon is also manufactured in various forms by five other companies. The German polyamide resins differ from nylon of the Du Pont type in that they are either caprolactam-type molecules or else urethane-type based on reaction between polyalcohols and *iso*cyanates. The conventional nylon based on hexamethylene diamine and adipic acid has also recently been introduced into Germany under Du Pont licence.

Both the Farbwerke Hoechst and the Vereinigte Glanzstoff-Fabriken AG have had considerable experience in the field of synthetic fibres and recently these two companies, acting in conjunction, have acquired exclusive rights for the production of Terylene in Germany; the raw materials will be obtained from Imhausen and Co., Witten, Ruhr. This latter company specializes in air oxidation processes and produces terephthalic acid by air oxidation of *p*-xylene.

### Silicones and Plastics

Silicones are produced in Germany by Wacker-Chemie and the Farbenfabriken Bayer. In 1953 the firm of Theodor Goldschmidt, Essen, started construction of a plant for the manufacture of silicone resins and oils.

As far as the authors know there have been no outstanding developments in the field of silicones in Germany. Manufacture is on conventional lines, all, of course, under Dow or General Electric patents.

Polyethylene is manufactured in Germany by the BASF at Ludwigshafen and by Anorgana, both under I.C.I. licence. Hoechst also makes polychlorotrifluoroethylene, the equivalent of "Kel-F", under the name of "Hostaflon".

Possibly the most significant post-war development in plastics has been in the field of unplasticized PVC. During the war, faced with a critical shortage of metals, German industry developed PVC to replace metals in all non-essential applications. Consequently the emphasis was on resins which could be processed into rigid articles and in particular extrusion grades. This is probably the main reason why German development of vinyl resins has concentrated on the emulsion polymerization process. Development of vinyls in the U.S. and U.K. on the other hand, has concentrated on their use as substitutes for rubber, that is to say in plasticized applications, and so the emphasis has been on suspension polymers.

By the end of the war, the Germans had developed to an extraordinary degree the application of rigid PVC in engineering and particularly in chemical engineering. They had devoted the most meticulous care to study of the engineering principles involved in utilizing this material and had worked out many ingenious techniques of fabrication. Subject only to its inherent temperature limitations, PVC has been and is still being widely used in innumerable chemical plant applications in Germany and is now enjoying increasing popularity in the U.K. and America for such purposes. It has taken us some years to catch up with the Germans in the technique of using vinyl in this way, but today we are not far behind in this field.

The manufacture of vinyl chloride monomer in Germany follows two main routes, according to the domestic economy of the manufacturing company. The conventional route is the reaction of dry acetylene with dry HCl in the presence of a mercuric chloride catalyst. A variant on this is the reaction of chlorine with acetylene to yield tetrachlorethane which is then cracked to HCl and trichlorethylene. The trichlorethylene is a desirable by-product, and the HCl resulting from this cracking is then reacted with more acetylene to give vinyl chloride. Thus in this modification both vinyl chloride and trichlorethylene are obtained, the special advantage to the company concerned being that this process consumes more chlorine, of which they happen to have a surplus.

A second most significant development in the plastics field

has been in urethane chemistry in which the pioneer was Dr Otto Bayer of Leverkusen. The urethane reaction, which takes place between an *iso*cyanate and a hydroxy compound, is a true condensation reaction, giving no volatile by-product. Moreover, the reaction nearly always takes place at ordinary temperatures. Great ingenuity has been shown in devising poly-hydroxy compounds, or special alkyds, which react with poly-*iso*cyanates to yield cross-linked urethane resins which are thermosetting, and hence irreversibly condensed, without the application of heat or pressure.

It is also possible by the same reaction to produce linear polymers which are thermoplastic and some of which are fibre forming.

A further ingenious variation is to leave some residual carboxylic acid groups within the alkyd, or to add a trace of water which, on reaction with the cross-linking *iso*cyanate, liberates $CO_2$, giving an expanded product. These are the so-called "foamed in place" compositions.

### The IG Farben Complex

No account of post-war development in the West German chemical industry would be complete without some mention of the fate of the former IG Farben complex.

At the end of the war the property of the IG Farben was brought under control in the various occupation zones and the administration taken over by the military governments; on 30 November 1945 Control Council Law No. 9 was passed, which placed the requisitioned assets of the IG Farben under four-power control. In the preamble to this law criticisms were made of the direction of the IG Farben which led later to the appearance of members of the board at the Nuremberg trials.

On 17 August 1950 Law No. 35 of the Allied High Commission was promulgated. This law dealt with the splitting up of the property of the IG Farben, stating in its first article that the unified control and direction of the former IG Farben had led to too high a concentration of economic strength for peaceful purposes, and that the total property should be divided into a number of economically sound and independent companies which would lead to healthier competition in the chemical and associated industries.

In the British and French occupation zones the larger production units such as Bayer with its factories at Leverkusen, Elberfeld, Uerdingen, and Dormagen, and the Badische Anilin-und Sodafabrik with its factory at Ludwigshafen, were operated by a German board under Allied supervision; in the American zone, however, each *factory* was administered as a unit on its own. By the beginning of 1952 matters had clarified and the future of the IG Farben complex was settled. There are three major successor concerns: the Farbenfabriken Bayer with its works at Leverkusen, Elberfeld, Uerdingen, and Dormagen, and the photochemistry factory, AGFA, at Leverkusen as a subsidiary; the Badische Anilin-und Sodafabrik at Ludwigshafen, and the Farbwerke Hoechst at Frankfurt am Main with its factories at Hoechst, Offenbach, and Gersthofen, and its more important subsidiaries the Behringwerke Marburg, the AG fuer Textil-Faser Bobingen, the Knapsack-Griesheim AG, and Kalle and Co., Wiesbaden.

These three major successors, together with their subsidiaries, each employ from 30,000 to 35,000 workers. There are a number of successors on a smaller scale, perhaps the most important being the Chemische Werke Huls, which was built in 1939 for the production of buna, but now manufactures a much wider range of products, including synthetic resins, solvents, plasticizers, glycol and its derivatives, detergents, and lacquer materials. Huls has between 7000 and 8000 employees.

Further independent companies from the former IG Farben Group are the Cassella Farbwerke and the Dynamit AG.

There was division, too, of the holdings of the IG Farben complex in other companies, the more important being as follows:

The 90 per cent holding in the Duisburger Kupferhutte, which specializes in the extraction of secondary metals from pyrites cinder originating in Germany and other European countries, was split equally between the Bayer Group, the BASF Group, and the Farbwerke Hoechst Group.

The 50 per cent holding of the IG Farben in Dr Alexander Wacker, Munich, was reduced to 49 per cent in order to enable the Wacker family to have a voting majority. The 49 per cent interest is held by the Farbwerke Hoechst, and the Wacker company has recently celebrated its majority by adopting the name "Wackerchemie".

The shares held by the former IG complex in the "Titan-Gesellschaft", in "Deutsche Erdol", in the "Chemiewerk Homburg", and the "Degussa" were all offered for sale. The factories at Rottweil and Rheinfelden were rented to French interests and their ultimate fate is even yet not quite clear.

It is difficult in limited space to treat a wide subject in a balanced manner and the authors are conscious of having had to omit discussion of many important aspects of the post-war German chemical industry; to name only one, research and development. They hope, however, not only to have indicated the highlights in post-war technology but also to have placed in perspective the recovery of the industry from war damage.

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## COUNCIL COMMENTARY

The opening Council Meeting of the 1954-5 session was held on 8 September, with the President, Colonel S. J. M. Auld, in the Chair.

It has been decided to publish the engine test methods for fuels now appearing in "Standard Methods" as a separate manual. Originally this new manual was to include details of the maintenance and erection of the test engines as recommended by the ASTM. However, the American society is considering a revision of these recommendations and it would not, therefore, be possible to include them in the first edition of the IP Manual without considerable delay. It has, therefore, been agreed to publish without this information.

The Organization for European Economic Co-operation has asked the Parliamentary Scientific Committee to organize a conference in the U.K. next year on the training and work of the chemical engineer. The DSIR has received sufficient encouragement from official bodies to undertake the organization of such a meeting which will probably take place in London next March. It is expected that this conference will last two-and-a-half days, and that papers will be contributed by the U.K. and Western Europe.

Publications Committee, having organized three successful Summer meetings, suggested that they should receive a definite directive from Council to organize such meetings every year except when other activities, such as the World Petroleum Congress, are planned. Council agreed this, and Publications Committee will thus be able to plan well ahead for these meetings and to secure the necessary accommodation in good time.

It has been suggested that a Building Fund be inaugurated with the eventual object of the Institute having its own house. Council agreed in principle to this proposal, and the House and Finance committees have been asked to investigate this matter and to report back in due course.

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## COUNCIL ELECTIONS 1955

Members are reminded that, under By-law 72, all nominations for the Council Elections in 1955 must be received by the General Secretary not later than 31 December 1954.

Applications must be made on the special Council Election form, proposed by a corporate member and supported by six corporate members. These forms can be obtained from the General Secretary, 26 Portland Place, London, W.1.

# Britain's Aircraft on Parade

## Impressive Display at Farnborough

Rapid means of transport for men and materials is essential to the petroleum industry and this year's display of the Society of British Aircraft Constructors at Farnborough once again brought to the fore the part which the British aircraft industry plays in this respect.

By courtesy of Percival Aircraft Ltd.

*The Hunting Percival* Jet Provost.

It is true that most of the aircraft on view or demonstrated in the air were designed primarily for military purposes, but it must not be overlooked that in many cases there are also civil versions. Thus, the Blackburn *Beverley*, designed for the dropping of heavy army equipment, has a civil version under development which will carry six cars and five motor cycles, plus 24 passengers. Similarly, the Hunting *Pembroke* is under development as the *Prince Series* 5 for civil use. There are quite a number of other passenger or freight machines and helicopters in this category.

Among the passenger or freight machines which were flown or on show were noticed the Bristol 173 helicopter for 10-13 passengers and the Bristol 170 freighter helicopter; the de Havilland *Comet* 2 for 44 passengers, the *Comet* 3 for 58-76 passengers, and the *Dove* for 8-11 passengers; the Saunders-Roe *Skeeter* 5 and *Skeeter* 6 helicopters; the Scottish Aviation *Pioneer* 2, 4-5 seater; the Vickers-Armstrong *Viscount* for 40-59 passengers; the Hunting Percival Aircraft Ltd. *Pembroke*, *Jet Provost*, and *Provost* 53 machines, and, not least among the giants, the Folland *Midge*.

In addition to the outdoor exhibits there was an indoor section, covering over 100,000 sq. ft., devoted to engines, parts, accessories, and materials. Here there was much equipment worthy of study, including the following exhibits by IP member-companies:

*Thomas Boorn & Co. Ltd.*—Fuel hoses, couplings, and clamps.

*The English Electric Co. Ltd.*—Electric systems and generators, motors, actuators, etc. Models of Canberra aircraft. The Company also had Canberras in the flying display and in the outdoor exhibition.

*Esso Petroleum Co. Ltd.*—Aviation service and fuels and lubricants.

*W. T. Henley's Telegraph Works Co. Ltd.*—Aircraft cables of all types.

*Imperial Chemical Industries Ltd.*—The Paints Division exhibited aircraft finishes and the Plastics Division illustrated the scope of its technical services.

*George Kent Ltd.*—Fuel flow meters for all types of aircraft and for refuellers.

*Mond Nickel Co. Ltd.*—Publications and information on nickel alloy steels and similar metals.

*The Pyrene Co. Ltd.*—Fire extinguishing systems, fire detectors, etc. In the outdoor exhibition, a modern crash and fire tender was shown.

*The Blackburn* Beverley, *which flew to Farnborough carrying a 12-ton transportable pipe-making plant, such as might be used in oilfield development.*

*Rubery Owen & Co. Ltd.*—Bolts and nuts and aircraft special parts.

*Shell-Mex and B.P. Ltd.*—Aviation service and fuels and lubricants.

*Stemco Ltd.*—Flow meters for aviation fuels and lubricants for deliveries of 85, 200, and 300 g.p.m.

Flying at Farnborough. (Left) *The de Havilland* Comet 3, *which with* Comet 2 *makes what is claimed to be the logically paired fleet for express world traffic;* (centre) *the* Bristol 173 *twin-motor helicopter;* (right) *the English-Electric* Canberra B8 *night intruder.*

# Personal Notes

**Sir Harold Roxbee Cox,** who until recently was chief scientist at the Ministry of Fuel and Power, has been elected a director of The Brush Group Ltd.

**L. M. Broadway,** has recently taken over the position of managing director of C. C. Wakefield and Co. Ltd. in succession to A. Limb. Mr Broadway joined the company 34 years ago, was elected to the Board in 1947, and became joint assistant managing director in 1952.

Ill health is the reason which has forced Mr Limb to relinquish his position as managing director, but he is to continue as a director of the company.

W. F. List is to hold the position of assistant managing director.

By the death of **J. A. Brongers,** Head of the Press Service, who died in the disaster which befell the K.L.M. plane "Triton" in the early hours of 5 September, the Bataafsche Petroleum Maatschappij has lost a talented and devoted employee.

After working for a few years as a journalist, Mr Brongers entered the service of the Bataafsche Petroleum Maatschappij in 1928 and was assigned to the Correspondence Department. In the same year he contributed to "De Bron", the Dutch Staff magazine, an article which was to be followed by many others.

His chance to develop his gifts came when he was later entrusted with the task of establishing the Press and Publicity Department, which he headed for several years. When the PP Department was reorganized and the Public Relations Department was formed, he was appointed Head of the Press Service in the new department. In carrying out this difficult task, which called for a deep insight into the affairs of the Royal Dutch-Shell Group and a thorough knowledge of the requirements of the Press, Mr Brongers was held in general esteem.

Highlights in his career were the Diamond Jubilee of the Royal Dutch in 1950 and the Third World Petroleum Congress in 1951, which kept him working literally day and night for many months. He had an inexhaustible store of energy, which was an inspiration to those who worked under him. Thanks to his knowledge of publicity work he was able to train and lead others. The editors of "Olie" likewise owe a debt of gratitude to him for his advice, and it is to a considerable extent owing to his efforts that the magazine has reached its present high standard.

Mr Bronger's career was tragically ended on the first stage of a three months' tour of North and South America, where he intended to study the work of his colleagues on the other side of the Atlantic.

By his death the Group loses a loyal and capable employee and members of the Public Relations Department of the B.P.M. lose an able and good colleague whose example will be an inspiration for many years to come.

**C. M. Spielman,** O.B.E., M.C., managing director of Whessoe Ltd. since 1935, has been succeeded in this position by **A. G. Grant,** director and general manager of the Company.

C. M. Spielman

Mr Spielman, who is retaining his seat on the Board, joined Whessoe in 1923 as works manager and became general manager in 1925. He has been managing director of the Company for almost twenty years, during which time the Company has prospered and expanded. Mr Spielman is a member of the Council of the British Welding Research Association and of the Admiralty Advisory Committee on Structural Steel.

Mr Grant first joined the Company in 1930, was appointed general manager in 1938, and became a director in 1942. He is a past chairman of the British Chemical Plant Manufacturers' Association and has served on the Councils of the Institution of Gas Engineers and the Institution of Chemical Engineers.

**J. Huré,** president and director general of the Société Générale des Huiles de Pétrole BP, Anglo-Iranian's French associate, has been promoted by the French Government to the grade of Commander of the Legion of Honour. This award is in recognition of the distinguished part which M. Huré has played in the recent development of the French oil industry.

M. Huré was made a Chevalier of the Legion of Honour in 1933 and an officer of the Order in 1947. In 1918 he was decorated with the Croix de Guerre.

**R. M. Serre** of New York has joined The M. W. Kellogg Co. as a senior sales representative and will represent the Company in the negotiation of engineering and construction contracts in the petroleum and petrochemical fields.

**J. R. S. Halford** has been appointed export sales manager of Industrial Truck Development Ltd. in succession to R. J. L. Fish.

**Dr B. K. Barman,** A.F.Inst.Pet., has recently joined the technical administration staff of the Assam Oil Co. Ltd. and is located in Digboi, Assam, India. Previously he was with Messrs Simon Carves Ltd. at Cheadle Heath, Stockport.

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## SHELL-MEX AND B.P. APPOINTMENTS

Shell-Mex and B.P. Ltd. announce the following appointments:

**C. A. Pink** to be retail marketing manager, London Division.

**C. E. Pike** to be marketing service manager, North Eastern Division, in addition to his present post of marketing service manager, Northern Division.

**H. Edwards** to be operations manager, Scottish Oils and Shell-Mex Ltd.

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## BICERA

C. G. Tangye, M.I.Mech.E., has been elected chairman of the Council of the British Internal Combustion Engine Research Association in succession to H. N. G. Allen.

# Sulphur Recovery at Grangemouth Refinery

## Completion of Expansion Scheme

The recent commissioning of a sulphur production unit at Anglo-Iranian's Grangemouth Refinery, on the Firth of Forth, has completed the refinery's post-war expansion scheme. This expansion has raised Grangemouth's capacity from 360,000 tons a year immediately after the war to its present 2,700,000 tons, and has cost over £14,000,000.

The sulphur production unit forms one of a group of three units commissioned during the past few months, the other two being a 60,000-tons-a-year catalytic polymerization unit and a Girbotol unit. The unit has a maximum capacity of 20 tons a day, but at present about 14 tons of raw sulphur a day are being produced for manufacture into sulphuric acid.

Feedstock is taken from the nearby catalytic cracking unit as $C_3$ and $C_4$ tail gases. The gases are purified in the Girbotol unit by the removal of $H_2S$ and other sulphur compounds, achieved by an absorption process involving the use of a solution of diethanolamine and caustic soda.

The unit was engineered and built by the Power Gas Corporation to a design by the Girdler Corporation.

After purification, the feedstock is fed into the catalytic polymerization unit. The $C_4$ stream is converted into high octane polymer as a component for premium-grade motor spirit, while the $C_3$ stream produces tetramer. The latter is piped to the British Petroleum Chemicals factory adjoining the refinery to be used in the production of chemicals.

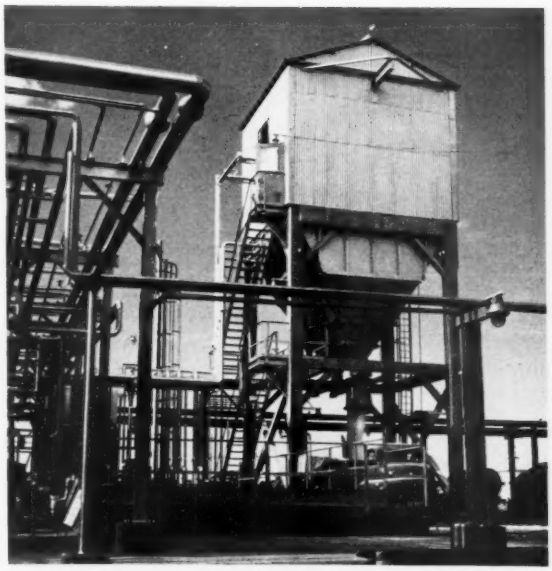
Anglo-Iranian photos

*Sulphur plant at Grangemouth refinery. This sulphur recovery unit is used to convert sulphur, extracted by the Girbotol unit, into raw sulphur. In the foreground is the converter where the gases are converted into sulphur. Next to it with a tall black funnel is the heating unit. The sulphur is scrubbed in the two square sulphur wash towers on either side of the heating unit.*

The catalytic polymerization unit, designed by U.O.P. and engineered by Kellogg International, is one of the few units in the United Kingdom to be electronically controlled. The electronic control desk was supplied by Evershed and Vignoles Ltd.

The sulphurous gas extracted by the Girbotol unit is processed by the sulphur production unit into flake sulphur. $H_2S$ entering the unit is burnt with a stoichiometric amount of air, controlled by a ratio flow controller, and then passes through a boiler feed water heater. It is cooled by scrubbing with molten sulphur, which condenses such sulphur as has been formed in the reactor.

The gases are then reheated and pass through a catalyst bed to complete the reaction. Further cooling takes place in a second boiler feed water heater and sulphur wash tower, and the gases are then passed through a furnace to destroy any final traces of



*Sulphur, in molten form, is pumped into this tower where it is converted into flake sulphur and then stored in hoppers for loading on to lorries.*

*A lorry being loaded with flake sulphur.*

$H_2S$. The molten sulphur produced overflows from the base of the wash towers into a storage pit, from where it is pumped on to flaking machines, mounted on the top of storage hoppers.

These machines are water-cooled drums which solidify the molten sulphur sprayed on to them. The sulphur is broken up into flakes by a metal blade and stored in the hoppers.

At intervals, lorries draw up under the hoppers and are loaded with the flaked sulphur. It is then transported to the sulphuric acid plant at Broxburn Crude Oil Works, one of the shale-retorting plants operated by Anglo-Iranian's subsidiary Scottish Oils Ltd., where acid was previously produced by the lead-chamber process.

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# New USBM Experimental Station

## Facilities for Petroleum and Gas Research

A new experimental station has been built for the U.S. Bureau of Mines at Morgantown, West Virginia, as a solution to the overcrowding of the Bureau's present pilot plant facilities. The construction of the new station was approved by Congress in 1951 and work began in 1952 on a 45-acre site on the outskirts of Morgantown. Approved expenditure on the construction of the new station was $2,600,000.

The station has been specially planned for efficient small-scale and pilot plant research on the gasification of coal and the production of petroleum. It consists of a principal structure housing laboratories and offices, and six auxiliary structures providing space for a pilot plant, coal preparation plant, oxygen plant, boiler and compressor plant, warehouse and shop areas, and a garage. The buildings occupy about 15 acres of land and some 113,000 sq. ft. of floor space is available for all operations.

Three branches of the Bureau's work will be accommodated at the new station: the Synthesis Gas Branch; the Petroleum and Natural Gas Branch; and a section of the Accident Prevention and Health Division.

The Petroleum and Natural Gas Branch of the Bureau has for several years been carrying out laboratory and field research on the secondary recovery of petroleum in the Appalachian region. Projected research includes studies on the petrography of reservoir rocks as well as the development of practical methods for increased recovery of petroleum. An important item in the facilities provided at the Morgantown station is a dry well, over 1100 feet deep, in which the Petroleum and Natural Gas Branch can study petroleum pumping recovery operations under carefully controlled conditions simulating those prevailing in producing wells in the Appalachian area.

The work of the Synthesis Gas Branch at Morgantown will be principally directed to the gasification of pulverized coal under pressure in pilot plant equipment.

The section of the Accident Prevention and Health Division which is to have its headquarters at Morgantown is to continue its principal work of coal mine inspection and safety instruction. It will provide safety services and Federal coal mining inspection to mines in the surrounding area. At present no special research on safe practices in coal mines is planned at the new station.

### The Work of the USBM

The research activities of the U.S. Bureau of Mines at Morgantown are only one aspect of the Bureau's work. Since its creation by Congress in 1910 as part of the Department of the Interior, the Bureau has had as its aim the conservation of human life and natural resources in the mineral industry. Today five broad purposes underlie the Bureau's programme and these have been summarized in the following terms:

(*a*) The development and conservation of America's mineral resources, particularly strategic resources and those vital to regional economics;

(*b*) economic studies of domestic and foreign mineral resources to aid Congress and the Executive Branch of the Bureau in formulating basic policy involving these resources;

(*c*) technical research in the mining, preparation, and utilization of minerals;

(*d*) assistance to the mineral industries through consultation, dissemination of technical data and statistics, and development of new techniques; and

(*e*) the promotion and development of safe and healthful working conditions in the mineral industries.

Policies and programmes to further these purposes are developed by the director of the Bureau and his central staff in Washington. They are implemented by regional directors operating in seven geographical areas in the continental United States, one in Alaska, and a ninth responsible for all foreign activities. Research at Morgantown is directed from the headquarters for Region VIII in Pittsburgh, Pennsylvania.

By courtesy of USBM

*A general view of Morgantown Experiment Station.*

# How Big is a Ship?

*A series of articles on volumetric and avoirdupois tonnages of ships*

*By* J. ANTHONY HIND,* A.M.I.N.A.

PART II—GROSS AND NET TONNAGES

Paradoxical as it may seem, gross and net tonnages have nothing to do with weight. They are purely capacity measurements where every 100 cubic feet of capacity is equal to one ton.

British Tonnage Rules are laid down in the Merchant Shipping Acts and interpreted in the official Ministry of Transport publication "Instructions as to the Tonnage Measurement of Ships". They are in three parts: Part 1, Measurement of British Vessels; Part 2, Measurement of Foreign Vessels; and Part 3, Suez Canal Special Tonnage Certificates. Panama Canal tonnage is dealt with in a supplement. It is Part 1 with which we are particularly concerned.

### Gross Tonnage

Gross tonnage is always measured first and consists of the total of the following spaces into which it is convenient to divide it:

(*a*) The capacity below the tonnage deck. The tonnage deck is the uppermost continuous deck in all ships which have less than three decks. In all other ships it is the second deck from below. The tonnage under this deck is known therefore as underdeck tonnage, but if the ship has a double bottom this is not included in the measurement. If a ship has a raised quarterdeck,

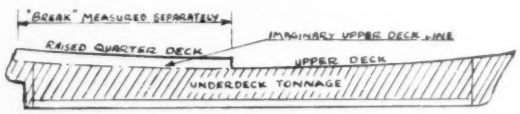


*Fig* 1. *Raised-quarterdeck ship showing treatment of a "break" in measuring tonnage*

as shown in Fig 1, then the underdeck tonnage is measured only to the imaginary line of the upper deck and what is known as the "break" is measured separately. Regulations are laid down as to how exactly measurements are to be taken in order to ensure as nearly as possible a uniform system of measurement no matter where the ship is measured. Simpson's first rule is used and no more than three inches may be allowed off measurements for tank top ceiling, insulation, or sparring on frames. The following definitions may be helpful:

*Tonnage length* (Fig 2) is the distance on the upper deck between the tonnage point forward and the tonnage point aft. The tonnage point is found at the intersection of a line drawn on the inside of the frames or sparring and the ship's centreline.

*Tonnage breadths* (Fig 3) are horizontal measurements inside frames or sparring.

*Tonnage depth* (Fig 3) is the depth at midships from one-third of the round of beam (camber) below tonnage deck at the centreline to the tank top ceiling.

(*b*) The capacity of the 'tween decks above the tonnage deck. Measurements are made (in a similar way to that described above)

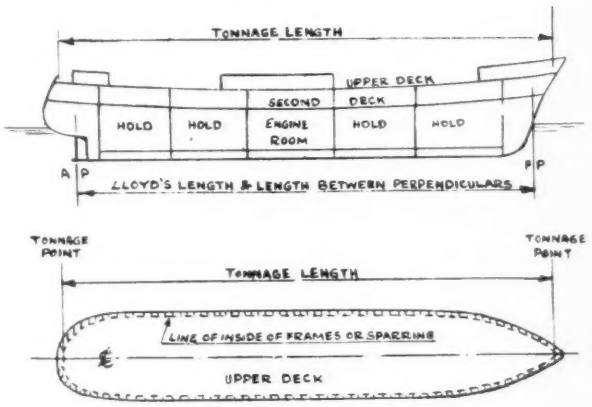


*Fig* 2. *Section illustrating tonnage definitions.*

at half height and a mean horizontal area is obtained which, multiplied by the mean height of the space and divided by 100, gives the 'tween deck tonnage.

(*c*) The capacity of spaces which are permanently closed-in on or above the uppermost deck and which are used for cargo, passengers, crew, or stores. These consist of all erections such as poop, bridge, and forecastle or deckhouses.

(*d*) The capacity known as "excess of hatches". To arrive at this the aggregate of the hatches is measured. From this, $\frac{1}{2}$ per cent of the gross tonnage is subtracted and the remainder is then added to the gross tonnage. (The $\frac{1}{2}$ per cent of the gross tonnage is calculated before the excess hatchways are added). This remainder is known as the excess of hatches. In other words, capacity of the hatches up to $\frac{1}{2}$ per cent of the gross is "free".

All open spaces and some enclosed spaces are exempt from inclusion in the gross tonnage. These spaces are known as *exemptions*. All exemptions are measured and appear on the Register Certificate, but they do not make their appearance in any British tonnage figures.

We shall deal first with those enclosed spaces which are

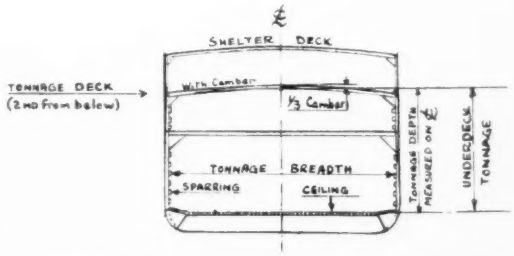


*Fig* 3. *Section through a shelter-deck cargo ship illustrating tonnage definitions.*

*Naval Architect, Hardy, Tobin and Co. Ltd.

allowed as exemptions. It is possible to discern in the regulations some early intention to establish the principle that spaces essential to the proper navigation, safety, and seaworthiness of the ship should not be penalized for their adequacy, but over the passage of years a number of anomalies have crept in. The result is that at the present time some parts of the regulations appear to be in disharmony with modern ship design.

The most important exemptions are for what are known technically as "open spaces". Many readers will be aware of the exemption of the bridge and forecastle spaces in tankers, which is a common example of this exemption. For an open space to qualify for exemption there are certain conditions to be satisfied. The regulations require "approved tonnage openings" to be fitted which have no permanently attached means of closing. This means that doors must not be fitted, nor is it permissible to close the space with a bolted-on plate if the bolts pass through the bulkhead. The size of the tonnage openings themselves must not be less than specified dimensions.

In the shelter deck type of ship we have the most interesting case of an "open" space qualifying for exemption. Provided certain peculiar and rather artificial regulations are observed it is possible to gain exemption for the whole of the shelter 'tween deck space. Tonnage laws dealing with the matter require approved tonnage openings all fore and aft in the 'tween deck bulkheads and a hatch known as a tonnage hatch, having no permanently attached means of closing. It must be fitted on the vessel's centreline on the shelter deck (upper deck) at a distance of not less than one-twentieth of the vessel's length from the sternpost. The regulations enter into the details of how the hatch may be closed and what size it may be. From the shipowner's and shipbuilder's point of view the regulations are designed to make it impossible for them to do what they would very much like to do—namely, nullify the embarrassing arrangement altogether by fitting what would be, in effect, permanent means of closing whilst at the same time still gaining the tonnage exemption. Various and somewhat irregular means are sometimes contrived, which may involve some sidestepping of the rules, in order to overcome such irritations. It is a fairly widely held opinion that cases could occur whereby the strict observance of the rules might seriously detract from the seaworthiness of a vessel.

The tonnage hatch is not popular with the Classification Societies, who urge the foregoing of the tonnage exemption in favour of some reduction of freeboard, which can be allowed if the bulkhead scantlings are increased suitably for an additional 'tween deck head of water and all tonnage openings permanently closed including the tonnage hatch.

It must be remembered that the shelter 'tween decks exemption is operative only when no cargo is being carried therein and it is worth mentioning that any enclosed space within an exempted space is not itself exempted.

COPY

## CERTIFICATE OF SURVEY

Merchant Shipping Acts, 1894 to 1952

Surveys 59
AND
REGISTRY FORM No. 1

PRESCRIBED BY THE COMMISSIONERS OF CUSTOMS AND EXCISE, WITH THE CONSENT OF THE MINISTER OF TRANSPORT AND CIVIL AVIATION

| Name of Ship | Port of intended registry | Official number (if there has been any former registry) |
|---|---|---|
| | | |

| Whether British or foreign built | Whether a sailing, steam or motor ship (if steam or motor ship, how propelled) | Where built | When built | Name and address of builders |
|---|---|---|---|---|
| Foreign | Actor<br>Single Screw | Germany | 1954 | Werft Nobiskrug<br>Rendsburg, Germany. |

| | | | Feet | Tenths |
|---|---|---|---|---|
| Number of decks | One & shelter Deck | Length from fore part of stem to the ~~aft~~ side of the head of the ~~stern post~~ rudder stock | 309 | - |
| Number of masts | Two | Main breadth to outside of plating | 42 | 6 |
| Rigged | Not | Depth in hold from tonnage deck to ceiling amidships | 23 | - |
| Stem | Raked | Depth in hold from upper deck to ceiling amidships, in the case of three decks and upwards | - | - |
| Stern | Cruiser | Depth from top of deck at side amidships to bottom of keel | - | - |
| Build | Clencher | Round of beam | | 812 |
| Framework and description of vessel | Steel, Cargo | Length of engine room (if any) | 45 | - |
| Number of bulkheads | Six | | | |

PARTICULARS OF TONNAGE

| Gross Tonnage | No. of tons |
|---|---|
| Under tonnage deck | 1167.73 |
| ~~Upper~~ Shelter between decks Houses in | 79.99 |
| Tunnel or trunk | |
| Forecastle Upper | 44.69 |
| ~~Bridge space~~ Forecastle | 15.24 |
| Poop | 58.50 |
| Break S | 24.34 |
| Side houses | |
| Deck houses | 394.27 |
| Chart house | |
| Spaces for machinery and light and air under sec. 78 (2) of the Merchant Shipping Act, 1894 | |
| Excess of hatchways | 5.89 |

| Cubic metres | | |
|---|---|---|
| Gross tonnage | 4775.74 | 1686.60 |
| Deductions as per contra | 2407.79 | 992.15 |
| Register tonnage | 1970.95 | 696.45 |

| Deductions Allowed | No. of tons |
|---|---|
| On account of space required for propelling power | 240.25 |
| Under sec. 79 of the Merchant Shipping Act, 1894, on account of spaces provided by way of crew accommodation as follows:— | 392.53 |
| Lower Deck, Poop and Inboard Houses | |
| Number of seamen or apprentices for whom accommodation is certified 30 | |
| Other deductions under sec. 76 of the Merchant Shipping Act, 1894, and sec. 14 of the Merchant Shipping Act, 1906, as follows:— | |
| Master's accommodation = 16.97 | |
| Chart space = 7.90 | |
| W/T space = 3.90 | |
| Tunnel (Part) (Plated) = 15.09 | 49.27 |
| Water Ballast Space = 34.61 | |
| Battery Room = 4.92 | |
| Fore Chain Locker = 1.30 | |
| Lamp Room = 2.58 | |
| Total | 682.45 |

NOTE 1.—The tonnage of the engine room spaces below the upper deck is 248.77 tons, and the tonnage of the total spaces framed in above the upper deck for propelling machinery and for light and air is 74.79 tons

NOTE 2.—The undermentioned spaces above the upper deck are not included in the cubical contents forming the ship's register tonnage—

Shelter Tween Deck: Part 1. L = 24'1 = 175.10 tons Part 2. L = 72'8 = 261.09 Tons

Part 3. L = 71'4 = 261.19 tons Part 5. L = 4'3 = 15.71 tons

Part 3. L = 46'4 = 37.59 tons

NOTE 3.—The location and tonnage of the boatswains store rooms are as follows—

Upper Fo'cle = 13.90 tons

Lower Fo'cle = 15.21 tons

S.H.1. = 9.91 tons

I, the undersigned Surveyor appointed by the Minister of Transport and Civil Aviation having surveyed the above-named ship, hereby certify that the above particulars are true, and that her name is marked on each of her bows, and her name and the port of registry are properly marked on a conspicuous part of her stern, and a scale of feet marked on each side of her stem and of her stern post, in manner directed by the Merchant Shipping Act, 1894

Dated at London

this 22nd day of July 19 54

Surveyor

*The above facsimile of a CERTIFICATE OF SURVEY in its latest revised form is reproduced with grateful acknowledgements to the Ministry of Transport and to the owners of the vessel concerned.*

*The reverse side of the form gives details of propelling engines or boilers.*

An instance of this is the store space in a tanker's lower bridge.

Other examples of exempted spaces are wheelhouse, crew's galley, toilets (not in suites), light and air trunks, double-bottom tanks, bilges, and spaces solely for machinery above the upper deck and necessary for the proper working or defence of the ship, such as steering gear compartment, windlass compartment, fan rooms, and gun turrets.

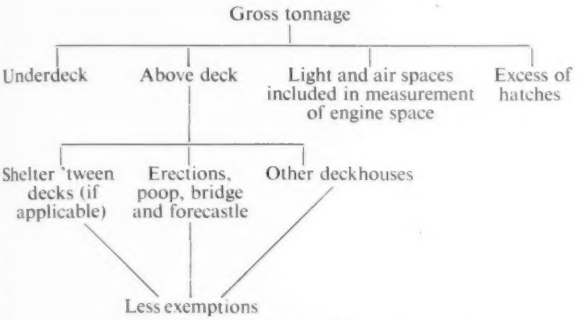


*Fig* 4. *Diagram of British gross tonnage*

**Net Tonnage**

Net tonnage is arrived at by making certain *deductions* from the gross. It is very important to remember that a deduction cannot be made from the gross tonnage in arriving at the net unless the space under consideration has first been included in the gross tonnage. In other words, the principle holds that what was not there in the first place can hardly be taken away! In spite of the rather elementary character of this statement it is surprising how easily it can be forgotten.

It follows as a corollary that it is no less important fully to realize the difference between an exemption and a deduction. It is as well to define these again:

An *exemption* is a space not included in any British tonnage measurement at all.

A *deduction* is a space which is included in the gross, but subtracted to arrive at the net.

The most important deduction is that for the propulsion machinery. It is known as the Propelling Power Allowance. This allowance has been amended by an Act of Parliament which became operative from 1 July 1954. The interesting question of "P.P.A." deserves special treatment on its own and will be discussed in the next article of this series.

The deduction next in importance is that for the living spaces allocated to the Master and crew, provided that they have been certified as complying with the regulations. All navigation spaces which are in use exclusively for the working of anchor gear or capstan and steering gear are deductible if below deck, but exempt if above. Other deductible items are the chart room, radio, radar and battery spaces, boatswain's stores (up to certain limits), and donkey and ship's main pump spaces, which are not included in the engine room measurement. In the case of peak tanks and deep tanks these must be adapted solely for the use of water ballast to qualify as deductible items and there is a limit to the allowance permitted, which is on a sliding scale according to the vessel's gross tonnage.

As a matter of interest, here are the tonnage particulars of a typical three-island type (*i.e.* poop, bridge, and forecastle) cargo steamer with triple expansion steam engines giving her a speed in service of 11 knots. She has a length of about 400 ft and a 52 ft beam, with a displacement of about 11,400 tons on a draught in the region of 25 ft. Of this displacement approximately 8100 tons is her carrying capacity in terms of deadweight. The gross tonnage is about 5200, of which nearly 4800 is the under-deck tonnage. The net tonnage works out at about 3200. The capacity of the cargo holds is about 422,000 cu. ft. bale or 454,000 cu. ft. grain. The grain capacity is always larger because the measurement is taken to the inside of the ship's shell plating, whereas for bale it is taken to the inside of frames or sparring. Tonnage particulars of a motorship are also shown on the facsimile of the Ministry of Transport's "Certificate of Survey" published here.

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**Deep-Sea Harbour for Small Boats at Mina al-Ahmadi**

By courtesy of the Kuwait Oil Co. Ltd.

*The Kuwait Oil Company's small boat harbour at Mina al-Ahmadi has recently been dredged to take deep-sea tugs drawing up to 18 ft of water. Two deep-sea tugs can now lie alongside the new tug jetty on the eastern breakwater.*

*The small boat harbour was originally constructed at the same time as the main oil and cargo jetty at Mina al-Ahmadi, but could be used only by shallow draught vessels such as launches and barges.*

*An approach roadway, narrow but wide enough to take essential traffic, has been constructed along the line of the breakwater so that the tug jetty is connected with the land.*

## TRADE LITERATURE, ETC.

### Laboratory Furnaces

Brochures giving details of laboratory furnaces and a photo-electric colorimeter manufactured by A. Gallenkamp and Co. Ltd. are obtainable from the Company at 17-29 Sun Street, London, E.C.2.

### Tube Bending Machinery

Production tube bending machinery manufactured by Chamberlain Industries Ltd. in conjunction with Walter P. Hill Inc. of Detroit, is to be distributed in the United Kingdom by Drummond Asquith (Sales) Ltd. of King Edward House, New Street, Birmingham.

### Miniature Recorder for Industrial Controls

An illustrated leaflet published by Evershed and Vignoles Ltd. gives details of a miniature recorder for use with modern industrial control equipment. The recorder is at present supplied for the measurement of voltage or current, and for temperature measurement operating directly from base-metal thermocouples. It can be adapted for flush or surface mounting, or for portable use.

### Air Compressors

A variety of portable and stationary air compressors were displayed at this year's Motor Show by H.E.C. Compressors and Engines Ltd. of Birmingham. A new addition to this Company's range of products is a series of mobile diesel-engine-driven units.

### Acid-resisting Cement

Details of a special acid-resistant cement are contained in a leaflet published recently by the Refractories Division of J. H. Sankey and Son Ltd., Ilford, Essex.

## OIL COMPANY ORDERS IN THE UNITED KINGDOM

The Oil Companies Materials Secretariat has issued the following statement of the value of orders for materials and equipment placed in the U.K. by oil companies during the period April to June 1954:—

| | £ |
|---|---|
| Geophysical and other exploratory equipment, etc. | 12,800 |
| Specialized equipment for oil drilling and production, including oil casing, tubing, etc. | 1,204,500 |
| Specialized equipment for oil refineries, etc. (not including pumps and valves) | 583,900 |
| Drum and can-making, filling and cleaning equipment, kerbside pumps, and other oil metering and dispensing equipment, etc. | 310,200 |
| Railcars, road tankers, aircraft refuellers, etc. | 30,500 |
| Drums, drumsheets, and tinplate | 1,796,700 |
| Tankage (including tank fittings) | 1,077,900 |
| Tubulars, pipe fittings, and valves (ferrous and non-ferrous) | 1,801,200 |
| Pumps, (excluding slush, oilwell, and kerbside) | 319,000 |
| Boilers, boiler house plant and accessories, etc. | 32,400 |
| Electrical equipment—motors, generators, transformers, etc. | 1,255,700 |
| Instruments, meters and gauges, etc. | 288,200 |
| Prime movers and compressors | 546,100 |
| Machine and hand tools, welding and miscellaneous machinery and stores | 1,349,400 |
| Ferrous and non-ferrous plates, sections, sheets, and bars | 448,700 |
| Automotive equipment, all types | 970,700 |
| Laboratory equipment and chemicals, including hospital and medical supplies | 204,400 |
| Bulk chemicals, catalysts, barytes, etc. | 4,359,400 |
| Cement and other building materials and hardware, including timber | 802,000 |
| Commissary, general requisites for office, warehouse, household, club, and sports, etc. | 1,045,600 |
| | £18,439,300 |

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## LABOUR STATISTICS FOR THE U.K. PETROLEUM REFINING INDUSTRY

The following figures are taken from the September 1954 issue of the *Ministry of Labour Gazette*. (cf. previous figures given in the *I.P. Review* (1954, **8**, 147)).

*Figures in bold type are the averages for all the industries covered by the tables.*

| | *Men (21 and over)* | *Youths and Boys* | *Women (18 and over)* | *Girls* | *All Workers* |
|---|---|---|---|---|---|
| No. of wage-earners covered by remuneration statistics | 16,961 | 605 | 775 | 14 | 18,355 |
| Average earnings in last pay-week in April 1954 (shillings) | 213 2<br>**197 8** | 81 0<br>**82 0** | 113 6<br>105 3 | —<br>**65 10** | 204 6<br>**166 6** |
| Average number of hours worked in this pay-week | 49.9<br>**48.3** | 45.4<br>**44.7** | 45.7<br>42.0 | —<br>**42.7** | 49.5<br>**46.5** |
| Average hourly earnings in this pay-week (pence) | 51.3<br>**49.1** | 21.4<br>**22.0** | 29.8<br>30.1 | —<br>**18.5** | 49.6<br>**43.0** |
| | | | *Males* | *Females* | |
| Numbers employed (July 1954) | | | 32,400 | 6,600 | 39,000 |
| Numbers unemployed (at 9 Aug. 1954) | | | 193 | 20 | 213 |
| Labour turnover rate (4 weeks ended 26 June 1954) | | | | | |
| No. of engagements per 100 employed | | | 1.6<br>**2.2** | 2.1<br>**3.3** | 1.6<br>**2.5** |
| No. of discharges and other loss per 100 employed | | | 1.1<br>**2.1** | 1.3<br>**3.2** | 1.2<br>**2.4** |

# Notes of the Month

### Cat-Crackers for Royal Dutch/Shell Refineries

Two new catalytic cracking plants are scheduled for construction at refineries belonging to the Royal Dutch/Shell Group. A 35,000-b.d. plant is to be built by the Compania Shell de Venezuela at its refinery at Cardon in Venezuela and a catalytic cracking plant is also to be installed at the refinery of the Curacaosche Petroleum Industrie Maatschappij at Curaçao, Netherlands Antilles.

In addition to the cat-cracker at Cardon a unit is planned for the production of the highest grades of aviation gasoline. Cardon already produces high-grade lubricating oils and the planned additions will make it one of the most complete refineries in the world.

It is expected that these new installations will be in operation by the end of 1957. The total cost of the construction work at both refineries will be over £20 million.

### New Esso Tanker

*Esso York*, the fifth 26,650-dwt super tanker to be built in Britain for the Esso group of companies, was launched recently from Vickers Armstrong Naval Yard, Walker-on-Tyne. The ceremony was performed by Mrs Leslie Pollock, wife of J. L. N. Pollock, a director of Esso Petroleum Co. Ltd.

The new ship is capable of carrying a cargo of over 25,000 tons; she has a speed of 16 knots, and a remarkably high rate of discharging cargo—3000 tons an hour.

At a reception following the launching Mr Pollock contrasted the new vessel with s.s. *Gluckauf*, launched from the same yard in 1886, which was one of the first ships ever built for the bulk transport of oil.

Speaking of the great progress which had been made in the scientific and industrial fields, Mr Pollock said that it was a matter of concern to many in industry today that this progress had not been matched by similar progress in the more abstract field of human relations.

Mr Pollock referred in particular to the oil industry and said: "In our own industry we are perhaps at some disadvantage because we can seldom produce such direct evidence of the results of our efforts. That is why we are striving constantly to improve our lines of communication within our own organisation, to increase the individual's sense of participation in the enterprise, to provide organized channels and training for advancement, and to develop a much greater awareness of the responsibilities and obligations of those *in* authority as well as of those *under* authority. Our experience at least has been that such methods do help substantially to create harmony, and understanding, between groups and individuals."

### AIOC Lecturers

Three members of the staff of the Anglo-Iranian Oil Company Ltd. delivered papers at international conferences during September.

At the International Instrument Conference, sponsored by the Instrument Society of America and held in Philadelphia, two AIOC engineers, S. W. J. Wallis and R. F. C. Simpson, presented a paper entitled "Concept and Practice for Co-ordinated Control Systems". The paper dealt with future developments in the application of electronic instruments to the control of processes and in particular with the use of a master instrument to control a crude distillation unit. The first crude oil distillation units in the world to be electronically controlled are now operating at Anglo-Iranian's new Aden refinery, and other units at several AIOC refineries are also electronically controlled.

Another AIOC lecturer was Dr T. F. Gaskell, a research physicist at the Company's research station at Kirklington Hall, who attended the tenth assembly of the International Union of Geodesy and Geophysics at Rome. Dr Gaskell, who is one of the two scientists who hold the record for the world's deepest ocean sounding of more than six miles, recorded off the Mariana Islands in the Pacific, read a paper on the results of deep ocean seismic surveys.

World Glory, *pictured on her maiden voyage, when she arrived at Mina al-Ahmadi, Kuwait, to load crude oil for Philadelphia. This* 45,000*-ton tanker belongs to the Trans-Ocean Shipping Company and is the largest ever built in the Western Hemisphere.*

### Test Well on Mafia Island

A test well is to be drilled on the island of Mafia, off the coast of Tanganyika, by the D'Arcy-Shell Petroleum Company of Tanganyika. The Company is a joint enterprise of the Anglo-Iranian and Shell Groups, which in 1951 began to make geological and geophysical surveys of wide areas of East Africa.

His Excellency the Governor of Tanganyika, Sir Edward Twining, recently visited the site of the proposed well where a platform for a 136-ft high drilling rig is nearing completion.

### Export Mission to Latin America

J. P. Ford, chairman of the Institute of Export, is now touring Latin America to find ways of increasing trade between the United Kingdom and the South American continent, particularly for power plant and capital engineering equipment.

Mr Ford is also a Council member of the London Chamber of Commerce and, at the Government's request, is giving talks on British industry to Chambers of Commerce and other meetings of industrialists in Central and South America.

During his tour Mr Ford will also be exploring export markets for the products of The Brush Group Ltd. in his capacity as managing director of the three Companies responsible for the Group's export sales, Associated British Oil Engines (Export) Ltd., Brush Export Ltd., and National Oil Engines (Export) Ltd.

### Ant Extermination Project

A five-year project costing £A100,000 is to be undertaken at Perth, Western Australia, to control the Argentine ants which are causing considerable damage in urban areas of Western Australia. The ants are half-an-inch long and inflict painful bites.

Shell's new insecticide, dieldrin, is to be used in the spraying operations which will begin on the north side of the Swan river on which Perth is situated, as this is the most heavily infested area. The outskirts of Perth will be treated later.

Only one spraying of dieldrin will be required, and this will be carried out in a lattice pattern dividing the area into a series of squares which the ants cannot leave without crossing the dieldrin-treated strips. In addition, all gutters and pavements will be treated. "Worker" ants seeking food will be killed off and eventually the whole ant colony will be killed or starved to death.

### British Association Visit to Esso House

The Esso European Laboratories at Esso House, Abingdon, were visited recently by members of the Chemical Section of the British Association.

Dr E. B. Evans, chief chemist, received the visitors and gave a short introductory talk. The visitors then toured the Laboratories, inspected a selection of the most modern apparatus, and saw various types of fuels and lubricants undergoing engine tests.

The Laboratories are controlled by Esso Development Co. Ltd. and are the principal research centre for the Esso Group of companies in Europe.

### New Brush Group Company

A new company, Brush Group de Venezuela Sociedade Anonima, is to be responsible for the future trade of The Brush Group Ltd. in Venezuela. The Group's activities in Venezuela were previously carried out by their agents, Compania Anonima Motoria, a member of whose staff, C. P. Court, has been appointed director and manager of the new Company.

The Brush Group has recently been giving particular attention to the South American export market and it is hoped that the formation of a company in Venezuela will result in increased sales in that area.

### Esso Chess Club

*W. H. Davies, chairman of Esso Chess Club, receiving from Hugh C. Tett a silver challenge cup which the directors of Esso have presented to the Club. The cup is to be competed for annually by members of the Club, and later Mr Tett, who is also president of the Club, presented it to the 1953/54 winner, P. N. H. Alford (Esso Development Co. Ltd.). Mr Davies is chairman of the IP London Branch and Mr Tett has served the IP as a vice-president, chairman of Council, and a member of various committees.*

### Expansion at Shell Haven

A new plant for the production of liquefied petroleum gases is now under construction at the Shell Haven oil refinery of the "Shell" Refining and Marketing Co. Ltd.

The plant will cost approximately £300,000 to build and is expected to be completed by the middle of 1955. It will produce and handle 10,000 tons of butane and propane each year and help to meet the growing demand for these gases for domestic and industrial purposes. This demand has increased by several hundred per cent in the United Kingdom since the last war.

New storage facilities will have to be provided at Shell Haven in which to store the gases under pressure and so keep them in a liquid state at normal temperatures. Large spherical tanks will be erected for butane, and high-pressure long cylindrical vessels, known as "bullets", for propane.

A bottling plant is also to be set up, with equipment for pressure-testing the steel bottles and filling machines. This plant will deal only with the bottling of propane, but bulk loading facilities are to be installed for filling road tankers and rail cars with both propane and butane.

### Germany's Oil Industry

In a special survey published by *The Financial Times* on 13 September 1954 and entitled "Industrial Germany", an article by A. M. Stahmer states that:

"Germany, though taking but eighteenth place among crude oil producers, now occupies fifth place in drilling performance, after the United States, the Soviet Union, Venezuela, and Canada: depth borings in 1953 totalled 340 miles. Twenty-five oilfields and seven natural gas deposits have been discovered since the war. Output rose to 2.2 million tons in 1953, and may exceed 3 million tons a year during the next few years. At the beginning of 1953, the German Geological Survey estimated definite and potential reserves at 55 million tons. Upper Bavaria, the region north of Lake Constance, and the Upper Rhine valley are considered particularly promising fields for prospecting."

Total crude oil capacity of German refineries at the end of 1953 was 9,780,000 metric tons per year. Details are given as:

| | Thousand metric tons/yr. |
|---|---|
| B.P.Benzin-und Petroleum Hamburg-Finkenwerder | 740 |
| Deutsche Erdoel Heide und Wietze | 650 |
| Deutsche Gasolin Dollbergen | 120 |
| Deutsche Shell Hamburg-Harburg | 700 |
| Deutsche Shell Monheim | 200 |
| Deutsche Vacuum Oel Bremen-Oslebshausen | 710 |
| Esso Hamburg-Harburg | 1840 |
| Gelsenberg Benzin Gelsenkirchen | 1300 |
| Gewerkschaft Deurag-Nerag Misburg | 530 |
| Oelwerke Julius Schindler Hamburg-Neuhof | 200 |
| Ruhrbau Muelheim | 300 |
| Ruhrchemie Oberhausen | 280 |
| Ruhroel Bottrop | 120 |
| Scholven-Chemie Gelsenkirchen-Buer | 400 |
| Union Rhein. Braunk. Kraftstoff Wesseling | 1300 |
| Wintershall Salzbergen | 90 |
| Miscellaneous plants | 300 |
| | 9780 |

Since the beginning of 1954 the new GEE-refinery at Lingen-Holthausen, Emsland, having an annual capacity of 500,000 metric tons, has been taken into service and the capacity of the B.P. refinery at Hamburg-Finkenwerder has been increased to 1,300,000 metric tons.

### Sulphuric Acid Plant at Stanlow

A plant capable of making 33,000 tons of sulphuric acid a year was recently installed at the Stanlow oil refinery of the "Shell" Refining and Marketing Co. Ltd., and is now in operation. This means that Stanlow is now entirely self-sufficient for supplies of sulphur and sulphuric acid.

A sulphur recovery plant was installed two years ago to recover sulphur from hydrogen sulphide—one of the by-products of oil refining. This plant produces about 15,000 tons of sulphur a year

which until recently was used in the interests of the national economy to meet the needs of British consumers. With the easing of the sulphur supply position, some of this sulphur output will now be used to manufacture sulphuric acid to meet Stanlow's own requirements.

Sulphuric acid is produced in the following way: hydrogen-sulphide is burnt with some elemental sulphur to produce sulphur dioxide. This is then passed into the sulphuric acid contact plant which is of conventional design. The sulphur dioxide stream is dried in a tower by use of 93 per cent acid and then fed to a four-stage converter. Here the sulphur dioxide is converted to sulphur trioxide over a vanadium pentoxide catalyst and subsequent absorption of sulphur trioxide is carried out in two towers which produce 98 per cent sulphuric acid and 20 per cent oleum respectively.

### "Electronics at Work"

An exhibition of electronic aids to production, design, and research has been arranged by the Scientific Instrument Manufacturers' Association, and is to be held in the Chamber of Commerce Hall, Birmingham, from 23 to 25 November.

A large number of working demonstrations will illustrate the way in which electronics can be used in industry, the public services, medicine, and education, as well as in research and development.

Admission to the exhibition is by ticket, obtainable free on request from the Association at 20 Queen Anne Street, London, W.1.

### Careers Convention at Esso House

A convention aimed at "bringing together representatives of the worlds of education and industry" met at Esso House, Abingdon, from 6-9 September.

The convention was arranged by the Public Schools Appointments Bureau and the Esso Petroleum Company, in conjunction with the Pressed Steel Company Ltd., Morris Motors Ltd., Huntley and Palmers Ltd., and Associated Deliveries Ltd. Twenty-one careers masters from public schools were present, together with three representatives of the Public Schools Appointments Bureau.

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## THE VOICE OF THE PAST

### Very Private Enterprise

The story of the cunning of Mr Rilsky in diverting the oil from the pipelines of other producers into his own tank is now a matter of history, but the facts have never been laid before English readers. The matter is now before the Russian Law Courts, and we are thus enabled to give the details of Mr Rilsky's scheming. With the co-operation of seven of his staff, who are charged with assisting him in his nefarious work, Mr Rilsky managed to lay a secret pipeline, by means of which he was able to intercept the oil running from various properties.—Report in the *Petroleum Review*, 1900.

### The Inscrutable East!
### Japanese and American Capital in the Oil Business

In order to anticipate any false impression that may arise in regard to the organization and purposes of the Pacific Oil Company, writes a correspondent in the *Japan Times*, the managers of that company have requested the publication of the following statement: The Pacific Oil Company is a temporary organization registered under the laws of Japan for the purpose of facilitating the organization of a permanent company which will be composed of prominent Japanese gentlemen of capital and standing, associated with American gentlemen, equally well-known in regard to financial standing and prominence in their country. Owing to the unavoidable delay occasioned in the preparation of the articles of association of the permanent company...—*Japan Times*, 1900.

### The Scottish Shale Fields

Oil from the eleven shale pits of Scottish Oils Ltd., which have a combined output of 1,400,000 tons of mined shale a year, is processed at the Pumpherston Oil Refinery nearby.

An Anglo-Iranian photo

*A general view of Pumpherston Refinery.*

There, crude oil is processed into various products including motor spirit, solvent naphthas, diesel oil, paraffin wax, and domestic detergents.

An Anglo-Iranian photo

*A miner drilling shale at the Burngrange Pit, of Scottish Oils Ltd.*

Other products of the Scottish shale industry include bricks for industrial building.

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## CRUDE OIL PRODUCTIONS

| | 1954 | |
|---|---|---|
| | *August* | *Jan. to Aug.* |
| | *Tons* | |
| Kuwait Oil Co. Ltd. | 4,236,732 | 30,280,177 |
| Iraq Petroleum Co. Ltd.—Kirkuk | 2,027,910 | 15,615,844 |
| Basrah Petroleum Co. Ltd.—Zubair | 427,562 | 2,889,422 |
| Mosul Petroleum Co. Ltd.—Ain Zalah and Butmah | 109,355 | 865,928 |
| Qatar Petroleum Co. Ltd. | 385,920 | 3,054,734 |
| | *Brl* | |
| Kern Oil Co. Ltd.: | | |
| California | 102,298 | |
| Trinidad | 82,577 | |

# Forthcoming Meetings

## THE INSTITUTE

(*At 26 Portland Place, London, W.1, 5.30 p.m.—tea 5 p.m.*)

**The Chromatographic Analysis of Hydrocarbon Mixtures.** B. W. Bradford, B.Sc., Ph.D., A.R.C.S., D.I.C., F.R.I.C., F.Inst.Pet., D. Harvey, A.R.I.C., and D. E. Chalkley, B.A., B.Sc. **10 November**

**The Cadman Lecture. Winning Petroleum — A Story of British-American Co-operation.** C. A. P. Southwell, C.B.E., M.C., B.Sc. (Kuwait Oil Co. Ltd.). At the Royal Institution, Albemarle Street, London, W.1. **17 November**

**Design and Operation of a Fluidized Pilot Plant for the Fischer-Tropsch Synthesis.** C. C. Hall, M.Sc., Ph.D., F.R.I.C., and A. H. Taylor, M.B.E., B.Sc., M.I.Mech.E. (Fuel Research Station, DSIR). **8 December**

## IP FAWLEY BRANCH

(*At Esso (Fawley) Recreation Club, Holbury, 7.30 p.m.*)

**The Design and Manufacture of Welded Pressure Vessels.** T. B. Webb, B.Sc., M.I.Mech.E., M.A.S.M.E. **19 November**

**The Application of Electronics to the Oil Industry.** J. M. Keating, B.Sc. **17 December**

## IP LONDON BRANCH

(*At 26 Portland Place, London, W.1, 6 p.m.—tea 5.30 p.m.*)

**Agricultural Pesticides.** J. L. Hunt, Dip.Hort. (Wye). **18 November**

**Film Evening.** **16 December**

## IP NORTHERN BRANCH

(*At Engineers' Club, Albert Square, Manchester 2, 6.30 p.m.*)

**Wax—The Most Versatile Product of the Oil Industry.** C. F. McCue, B.Sc., and S. Curds. **16 November**

**Film Show** (Warner's Theatre) and hot pot supper. 5.45 p.m. **14 December**

## IP SOUTH-EASTERN BRANCH

(*At King's Head Hotel, Rochester, 7.45 p.m.*)

**Non-destructive Testing and its Uses in Petroleum Industry.** Dr F. H. Gotfeld. **2 November**

**Control Valves.** F. Watts, B.Sc. **7 December**

## IP SOUTH WALES BRANCH

(*At the Training Centre, National Oil Refineries Ltd., Llandarcy, 5.30 p.m.—tea 5.0 p.m.*)

**Ocean-going Tanker Practice.** Captain R. A. Page. **4 November**

**Conversazione.** Dr M. Benger. **2 December**

## IP STANLOW BRANCH

(*At the Grosvenor Hotel, Chester, 7.30 p.m.*)

**Safety Symposium. The Training and Duties of Fire Auxiliaries:** T. K. Urmston, Grad. I.F.E. **Safety Permits:** E. R. Harding, I.I.S.O. **Protective Clothing:** H. S. Moore. **17 November**

**Film Show.** At the Tatler Theatre, Chester. 2.30 p.m. **28 November**

**Chemicals from Petroleum, the Growth of a New Industry.** E. S. Paice, B.Sc., A.R.C.S., D.I.C. **15 December**

## OTHER SOCIETIES

**The Pulsed Column in Liquid-liquid Extraction.** J. A. Williams and D. J. Little. The Institution of Chemical Engineers, North Western Branch, Grosvenor Hotel, Chester. 7 p.m. **10 November**

**Evaporator Entrainment.** Prof F. H. Garner, S. R. M. Ellis, and J. A. Lacey. The Institution of Chemical Engineers, Midlands Branch, The University, Edmund Street, Birmingham. 6.30 p.m. **10 November**

**Measurement of Flow.** The Institution of Mechanical Engineers, Hydraulics Group, London. 6.45 p.m. **16 November**

**Some Problems in Lubrication and the Substances called Additives.** A. Towle. The Institution of Mechanical Engineers, Automobile Division, London. 5.30 p.m. **14 December**

**Recent Studies of Metallic Friction.** F. P. Bowden, Sc.D., F.R.S. The Institution of Mechanical Engineers, London. 5.30 p.m. **17 December**

**The Servicing of Electronic Measuring Instruments and its Effect on their Design.** Discussion opened by D. Taylor, M.Sc., Ph.D. The Institution of Electrical Engineers, Measurements Section, London. 5.30 p.m., tea, 5 p.m. **30 November**

**The Applications and Limitations of Electronic and other Computers.** Discussion opened by L. G. Brazier, Ph.D., B.Sc. The Institution of Electrical Engineers, London. 5.30 p.m., tea, 5 p.m. **6 December**

**Special Study of Sulphur Removal and Recovery from Fuels.** The Institute of Fuel, North Western Section, Engineers' Club, Albert Square, Manchester. All day. **8 December**

**Social and Industrial Consequences of the Presence of Sulphur in Fuels.** Paper 1 in Sulphur Study. Dr A. Parker. The Institute of Fuel, Midland Section, James Watt Institute, Great Charles Street, Birmingham. 6 p.m. **16 December**

**The Molecular Structure of Benzene: Some Unsolved Problems.** E. G. Cox. Society of Chemical Industry, Newcastle Section, The University, Durham. 7.45 p.m. **24 November**

**The Physico-Chemical Properties of Bitumens as Used in Mastic Asphalt.** D. C. Broome. Society of Chemical Industry. Road and Building Materials Group. At the Institution of Structural Engineers, 11 Upper Belgrave Street, London. 6 p.m. **2 December**

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## COURSE ON AVIATION FUELS

A short course on aviation fuels is to be held at The College of Aeronautics, Cranfield, Bletchley, Bucks., from 15 to 19 November. The course is intended primarily for mechanical engineers and others who wish to obtain an overall knowledge of the subject and its associated applications. Laboratory work and test bed demonstrations will play an important part.

The tuition fee is ten guineas and the residence charge, including full board, is £6 10*s.* 0*d.*

Copies of the syllabus and forms of registration can be obtained from the College Warden.

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## COMMONWEALTH FUND FELLOWSHIP

Twenty fellowships for advanced study and travel in the U.S.A. are offered to graduates of universities in the U.K. The fellowships are open to both men and women aged 23 to 32, and are tenable for 12 to 21 months. All expenses are provided for travel, study, and living and some adjustment of the stipends is made in the case of married men.

Further details of the conditions of the awards, and application forms, can be obtained through British universities or from The Warden, Harkness House, 35 Portman Square, London, W.1. The closing date for applications is 15 December 1954.

* * *

## SITUATIONS VACANT

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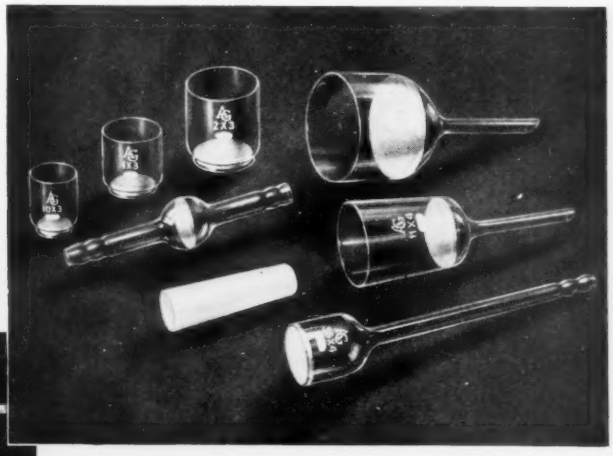

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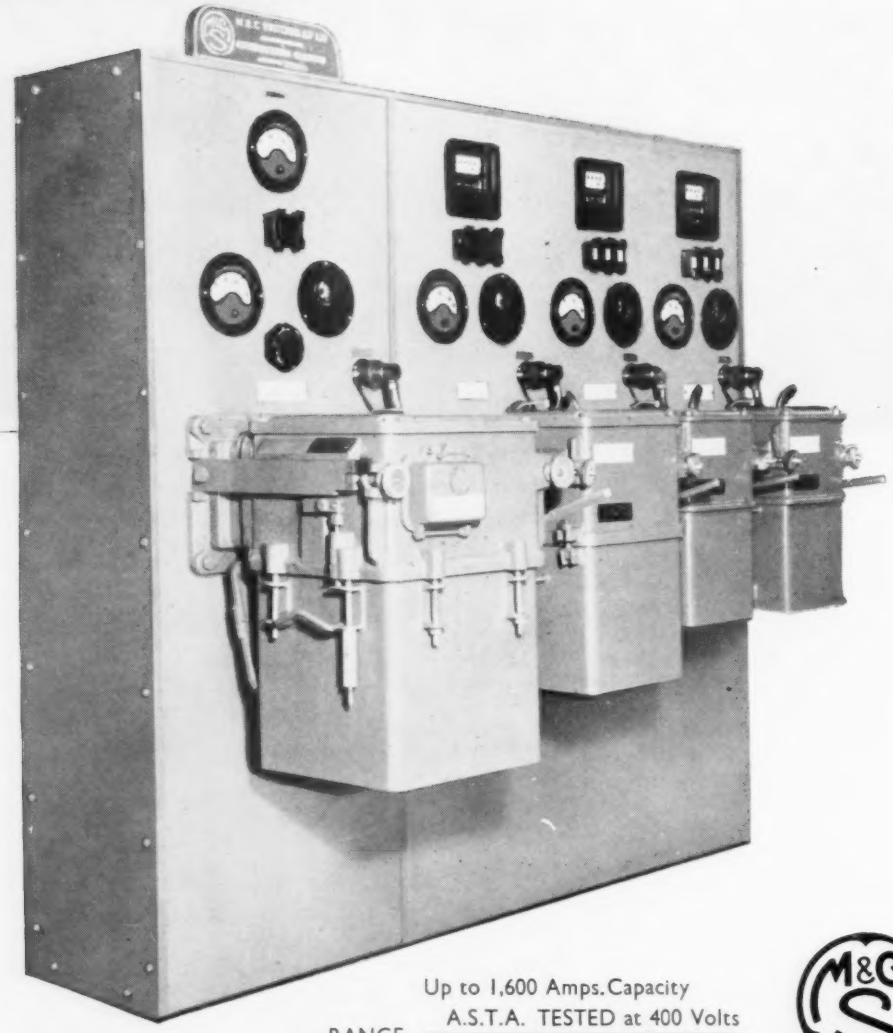

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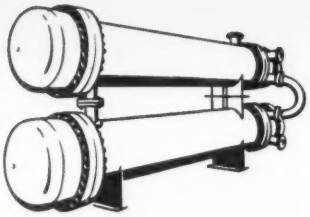

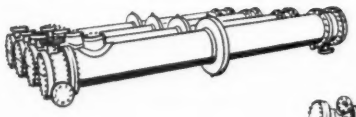

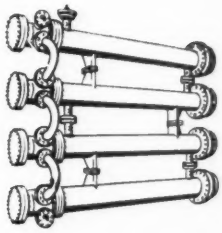

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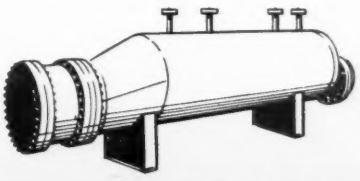

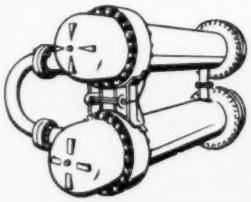

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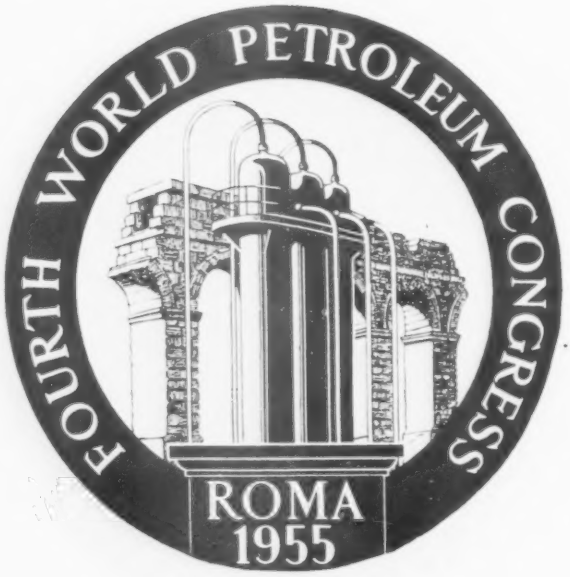


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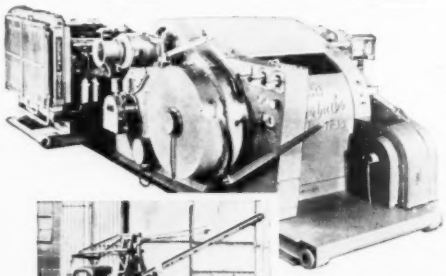

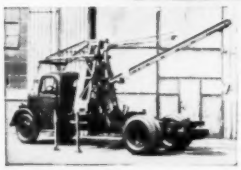

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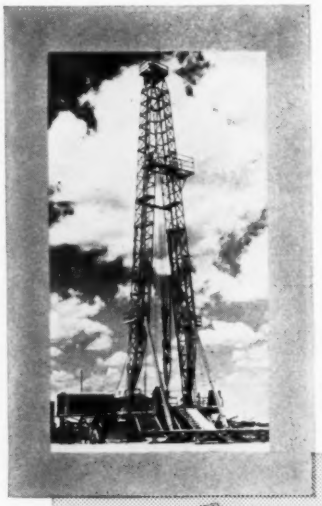

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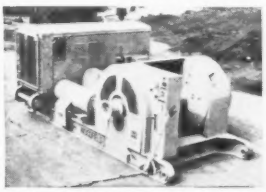

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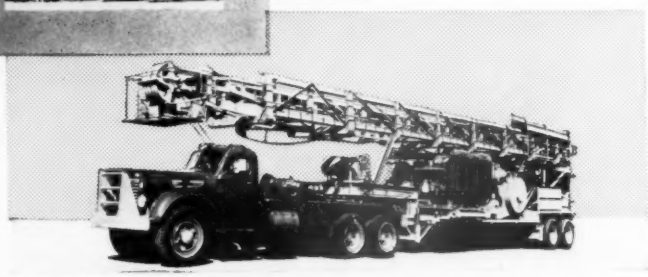

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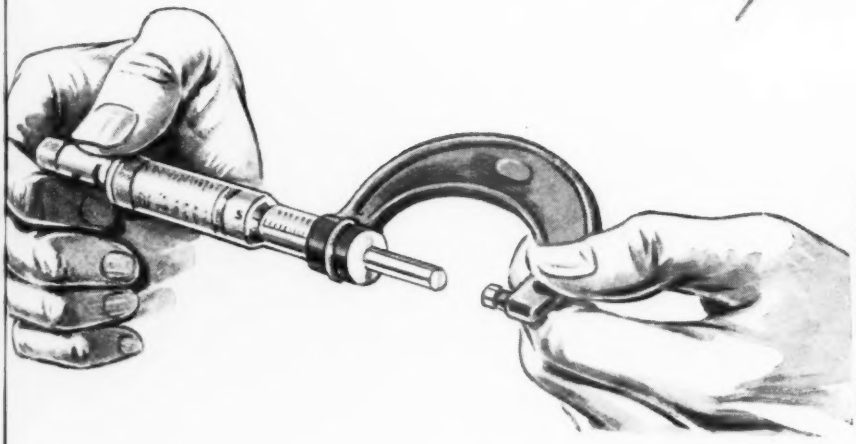

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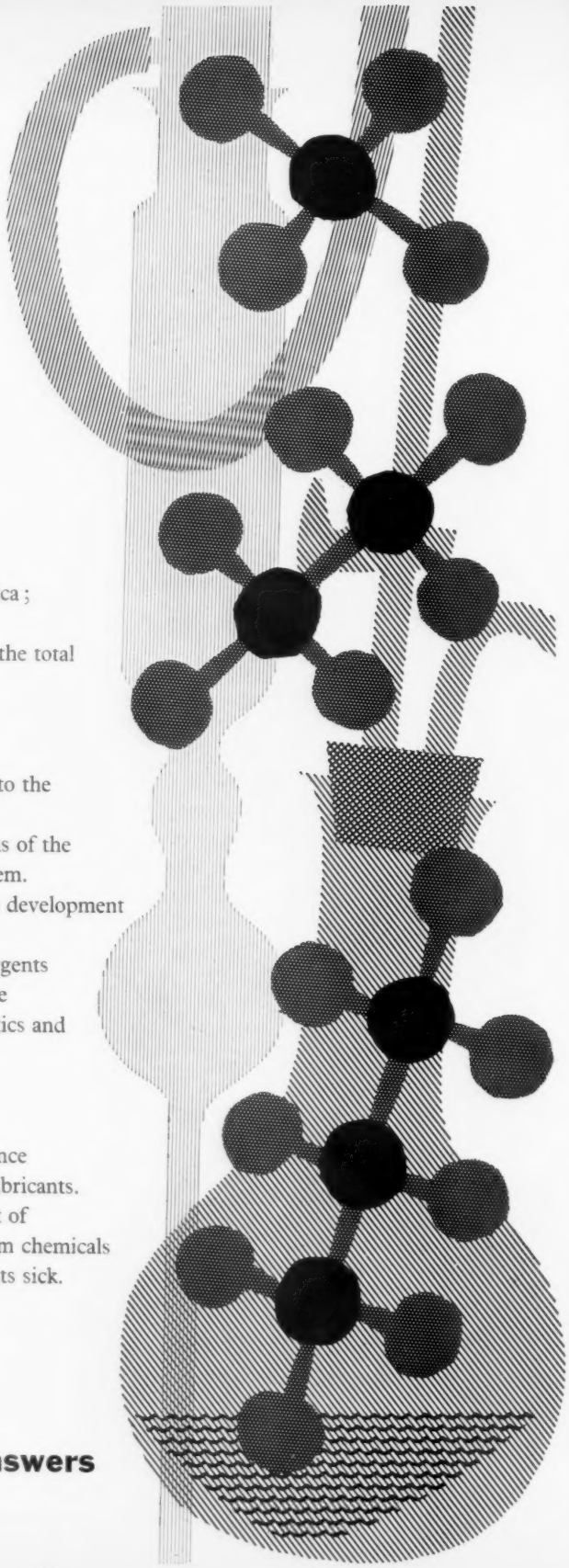

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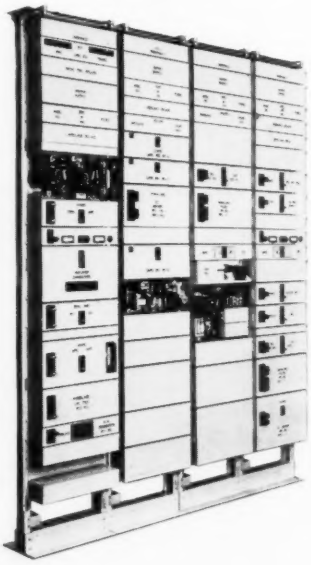

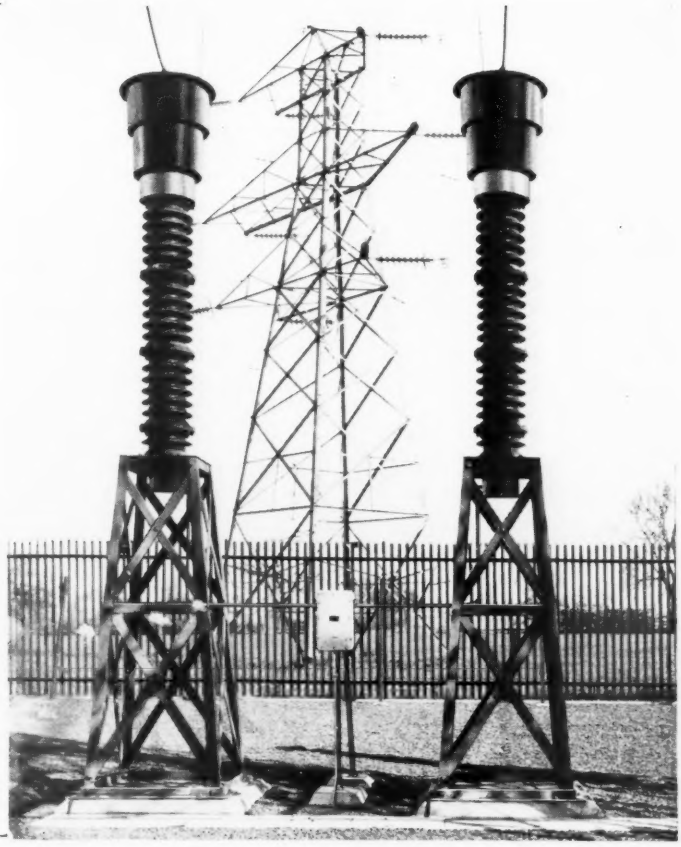

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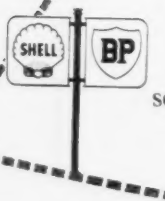

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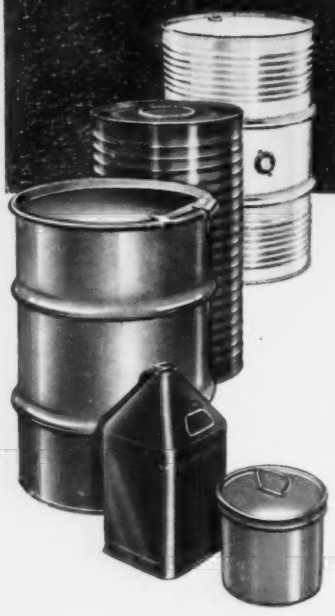

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